

Initial Study / Proposed Mitigated Negative Declaration Habitat Restoration of the Codora Unit on the Sacramento River National Wildlife Refuge



Lead Agency:

California Wildlife Conservation Board

Project Proponent:

The Nature Conservancy

December 9, 2008

EDAW | AECOM

Date: December 9, 2008

To: Responsible Agencies, Interested Parties, and Organizations

Subject: Notice of Availability and Intent to Consider an Initial Study/Proposed Mitigated Negative Declaration for Riparian Habitat Restoration of the Codora Unit, located within the Sacramento River National Wildlife Refuge, Glenn County, California

The California Wildlife Conservation Board (WCB), with planning assistance from The Nature Conservancy (TNC), has directed the preparation of and intends to consider adopting a Mitigated Negative Declaration (MND) for the proposed project in compliance with the California Environmental Quality Act (CEQA) and State CEQA Guidelines. WCB is the lead agency for the proposed project under CEQA.

Because the project seeks to restore habitat on federal property, it is also subject to the National Environmental Policy Act (NEPA), as amended, and its implementing regulations. The U.S. Fish and Wildlife Service (USFWS) prepared a NEPA Environmental Assessment (EA) evaluating the environmental effects of three proposed project alternatives for managing the Codora Unit. A Draft EA was released for public comment on October 3, 2008. The public comment period has closed (October 3 – November 17, 2008) and USFWS is preparing responses to comments on the Draft EA, which will be included in the Final EA. USFWS is expected to publish the Final EA with a “Finding of No Significant Impact” (FONSI) determination in early December 2008.

Project Location: The proposed project site is a 274.5-acre walnut orchard located within the 399-acre Codora Unit of the Sacramento River National Wildlife Refuge (SRNWR). The Codora Unit is located along the western bank of the Sacramento River at river mile 168.5-167.5. This Unit is located in Glenn County west of Butte City, between Colusa and Hamilton City at the intersection of state highways 162 and 45. The project site is located in the Beehive Bend subreach (RM 178-164) between the Sul Norte and Packer Lake Units of the Sacramento River NWR. The assessor’s parcel numbers (APNs) for the site are 013-180-17 and 013-140-19. The Codora Unit is bounded on the east by the Sacramento River, and bounded on the south, west and north sides by USFWS properties. The 274.5-acre project site is surrounded by restored and remnant riparian habitat, primarily cottonwood riparian forest and valley oak forest.

Description of the Proposed Project: The purpose of the proposed project is to restore riparian and associated habitats within the SRNWR Codora Unit in a flood neutral manner to help fulfill USFWS’ congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants.

The Codora Unit was acquired by USFWS as part of the SRNWR in 1994. The change in land use from agriculture to riparian habitat was approved at the time of acquisition; however, the site has remained in agricultural production with the understanding that it will eventually be restored to native habitats. The Unit’s 274.5 acres of walnut acres are currently managed under a Cooperative Land Management Agreement (CLMA) with TNC and leased to a tenant farmer. However, no trees have been replanted in the last ten years, and the orchard is losing productivity. Currently, the orchard is at less than 65% of its original productivity, especially because of unhealthy and lost trees.

The proposed project calls for the active restoration of 274.5-acres of the Codora Unit, which is currently used for walnut production, to 208 acres of valley oak savanna, 28.5 acres of mixed riparian forest, 30 acres of cottonwood riparian forest, and 8 acres of grassland. The restoration plan is consistent with the Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge, and the Final Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge, the results of the Beehive Bend Hydraulic Modeling report. The communities planned for habitat restoration are based on site assessments of the soil profile, topography, flood frequency and hydraulic modeling, depth to groundwater at base flows, weed community, and existing riparian community. The restoration design achieves flood neutrality with water surface elevations either being slightly reduced or remaining the same.

TNC would implement the proposed habitat restoration, including overseeing plant materials collection and propagation, site preparation and layout, planting, maintenance, monitoring, and reporting to the USFWS during the 3-year restoration implementation phase of the project. The implementation phase would be completed by winter 2013, at which time USFWS would manage the Codora Unit according to the Final CCP for the SRNWR. The CCP stated that the Codora Unit would eventually be open to five priority uses (fishing, wildlife observation, photography, interpretation, and environmental education), while remaining closed to hunting. However, these Big Five priority uses would be deferred until agricultural operations have ceased and restoration has been established.

Public Review Period: This IS/proposed MND is being circulated for a 30-day public review and comment period beginning December 9, 2008 and ending on January 8, 2008. Written comments should be submitted no later than 5:00 p.m. on January 8, 2008 to:

Anthony Chappelle, Riparian Restoration Program Manager
California Wildlife Conservation Board
1807 13th Street, Suite 103
Sacramento, CA 95811
Phone (916) 324-7487
Email: AChappelle@dfg.ca.gov

Copies of the IS/Proposed MND, along with documents referenced in the Initial Study, may be reviewed at the following locations during normal business hours:

- On line at: www.wcb.ca.gov
- California Wildlife Conservation Board, 1807 13th Street, Suite 103, Sacramento, CA 95811
- The Nature Conservancy, 500 Main Street, Chico, CA 95928
- Sacramento National Wildlife Refuge, 752 County Road 99W, Willows, CA 95928
- Colusa County Library, 232 Prince Street, Princeton, CA 95970
- Willows Public Library, 201 North Lassen Street, Willows, CA 95988
- Four Corners, 8071 County Road 61, Princeton, CA 95970

Your views and comments on how the project may affect the environment are welcomed.

PROPOSED MITIGATED NEGATIVE DECLARATION

Project: Riparian Habitat Restoration of the Codora Unit, located within the Sacramento River National Wildlife Refuge (SRNWR), Glenn County, California

CEQA Lead Agency: California Wildlife Conservation Board
(The lead agency for NEPA compliance is the U.S. Fish and Wildlife Service)

Availability of Documents: The Initial Study for this Mitigated Negative Declaration, along with documents referenced in the Initial Study, is available for review at the following locations:

- On line at: www.wcb.ca.gov
- California Wildlife Conservation Board, 1807 13th Street, Suite 103, Sacramento, CA 95811
- The Nature Conservancy, 500 Main Street, Chico, CA 95928
- Sacramento National Wildlife Refuge, 752 County Road 99W, Willows, CA 95928
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Project Description: The purpose of the proposed project is to restore riparian and associated habitats within the SRNWR Codora Unit in a flood neutral manner to help fulfill U.S. Fish and Wildlife Service's (USFWS) congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants.

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The proposed project calls for the active restoration of 274.5-acres of the Codora Unit, which is currently used for walnut production, to 208 acres of valley oak savanna, 28.5 acres of mixed riparian forest, 30 acres of cottonwood riparian forest, and 8 acres of grassland. The restoration plan is consistent with the Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge, the Final Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge, and the results of the Beehive Bend Hydraulic Modeling report. The communities planned for habitat restoration are based on site assessments of the soil profile, topography, flood frequency and hydraulic modeling, depth to groundwater at base flows, weed community, and existing riparian community. The restoration design achieves flood neutrality with water surface elevations either being slightly reduced or remaining the same.

TNC would implement the proposed habitat restoration, including overseeing plant materials collection and propagation, site preparation and layout, planting, maintenance, monitoring, and reporting to the USFWS during the 3-year restoration implementation phase of the project. The implementation phase would be completed by winter 2013, at which time USFWS would manage the Codora Unit according to the Final CCP for the SRNWR. The CCP stated that the Codora Unit would eventually be open to five priority uses (fishing, wildlife observation, photography, interpretation, and environmental education), while remaining closed to hunting. However, these Big Five priority uses would be deferred until agricultural operations have ceased and restoration has been established.

Findings: An Initial Study has been prepared to assess the proposed project's potential effects on the environment and the significance of those effects. Based on the Initial Study, it has been determined that the proposed project would not have any significant effects on the environment once mitigation measures are implemented. This conclusion is supported by the following findings:

- ▶ The proposed project would have no impact on the following resources: land use and planning, mineral resources, population and housing, recreation and utility and service systems.
- ▶ The proposed project would have a less-than-significant impact on the following resources: aesthetics, agricultural resources, geology and soils, hazards and hazardous materials, public services and transportation/traffic.
- ▶ The proposed project would have a less-than-significant effect after mitigation is implemented for the following resources: air quality, biological resources, cultural resources, hydrology and water quality, and noise.
- ▶ The proposed project would not induce growth in the surrounding community.
- ▶ Mitigation is required to reduce potentially significant impacts on air quality (construction-related emissions), biological resources (nesting birds), cultural resources (previously unknown resources and human remains), hydrology and water quality (sediment and erosion control), noise (construction-related noise).

The following are the mitigation measures that will be implemented by the WCB (CEQA lead agency) and USFWS (NEPA lead agency) as part of the proposed project to avoid, minimize, or eliminate significant environmental impacts. Implementation of these mitigation measures would reduce all of the environmental impacts of the proposed project to a less-than-significant level.

Air Quality

Mitigation Measure AQ-1: Implement Dust-Control Measures.

With the implementation of the following mitigation measures, short-term construction-generated air quality impacts would be reduced to a less-than-significant level. This mitigation measure would also minimize cumulative impacts on air quality.

Reasonable precautions shall be taken to prevent fugitive dust from leaving the project site, including, but not limited to:

- ▶ *land disturbing operations will be suspended when winds exceed 20 miles per hour (mph) to prevent fugitive dust and particulate matter from leaving the project site;*
- ▶ *dust control measures (e.g., water trucks) will be utilized as necessary to manage dust on the project site;*
- ▶ *all unpaved road surfaces shall be watered to minimize fugitive dust emissions;*
- ▶ *all unpaved surfaces, unless otherwise treated with suitable chemicals or oils, shall have posted speed limits of 15 mph;*
- ▶ *when materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions, or at least six inches of freeboard space from top of the container shall be maintained; and*
- ▶ *all operations shall minimize the accumulation of mud or dirt on adjacent public streets or expeditiously remove dirt at least once every 24 hours when construction activities are occurring.*

Biological Resources

Mitigation Measure BIO-1: Avoidance of Disturbance to Nesting Raptors and Special-status Birds.

Mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

To avoid nest disturbance and a potential reduction in fledging success resulting from construction activities during the breeding season (February 1 to August 31), focused surveys for raptors and special-status birds shall be conducted by a qualified biologist no more than 14 days prior to the beginning of construction. Surveys for Swainson's hawk nests shall include all areas of suitable nesting habitat within 0.25-mile of the project site. To the extent feasible, guidelines provided in the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in the Central Valley (Swainson's Hawk Technical Advisory Committee 2000) shall be followed. Surveys for other raptors and special-status birds would include suitable nesting habitat within 500 feet of the project site.

If no active nests are found, no further measures shall be needed. If active nests are found, impacts shall be avoided by the establishment of appropriate buffers and/or nest monitoring by a qualified biologist. The size of the buffer shall be determined by a qualified biologist and may vary, depending on the species biology, location, nest stage, and specific construction activities to be performed while the nest is active. No construction activities shall occur within a buffer zone until a qualified biologist confirms that the nest is no longer active.

Because this mitigation measure would avoid adverse effects to nesting raptors and special-status birds, the proposed project would result in a less-than-significant impact on nesting raptors and special-status birds.

Mitigation Measure BIO-2: Avoidance of Disturbance to Nesting Migratory Birds.

To avoid nest disturbance and a potential reduction in fledging success during any construction activities during the spring and summer breeding season, the project site's walnuts shall be harvested for the last time the previous autumn, and standard orchard maintenance practices (e.g., mowing and herbicide applications) would continue until construction begins to discourage bird nesting in the orchard before felling of the trees. As discussed above for raptors and special-status birds, mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

Because orchards would be restored to native habitats anticipated to support a higher diversity and abundance of wildlife species without significantly reducing populations of the species currently on site, the proposed restoration of native riparian habitat would have a long-term beneficial effect on wildlife. Potential impacts to existing wildlife that may occur during construction, maintenance, and visitor use of the proposed riparian habitat and recreational facilities would be expected to be minor. Because the benefits to wildlife of the proposed habitat restoration are expected to be more substantial than any potential construction, maintenance, or visitor use impacts that may occur, the overall effect of the proposed project is considered beneficial to wildlife species, including nesting raptors and migratory birds, and there would not be any substantial adverse effect to special-status species.

Cultural Resources

Mitigation Measure CR-1: If unrecorded cultural resources are encountered during project-related ground-disturbing activities, a qualified cultural resources specialist shall be contacted to assess the potential significance of the find.

If during project-related ground-disturbing activities unusual amounts of shell, animal bone, rock concentrations, dark midden soil, bottle glass, ceramics, structure/building remains, etc. are uncovered or otherwise encountered, ground disturbances in the area of the find will be halted within a 100-foot radius and a qualified cultural resources specialist will be contacted. The archaeologist shall determine whether the resource is potentially significant per the California Register of Historic Resources (CRHR) and develop appropriate mitigation. Appropriate mitigation may include no action, avoidance of the resource, and potential data recovery.

Implementation of Mitigation Measure CR-1 would reduce potentially significant impacts resulting from inadvertent damage or destruction of unknown cultural resources during ground disturbing activities to a less-than-significant level.

Mitigation Measure CR-2: Stop potentially damaging work if human remains are uncovered during project-related ground-disturbing activities, assess the significance of the find, and pursue appropriate management.

California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code Section 7050.5 and Section 7052 and California Public Resources Code Section 5097.

In accordance with the California Health and Safety Code, if human remains are found in any location other than a dedicated cemetery, the California Health and Safety Code requires that excavation is halted in the immediate area. The county coroner shall be notified and is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Section 7050.5[c]).

The responsibilities of the NAHC for acting upon notification of a discovery of Native American human remains are identified within the California Public Resources Code (PRC Section 5097.9). The NAHC is responsible for immediately notifying the person or group it believes is the Most Likely Descendant (MLD). With permission of the legal landowner(s), the MLD may visit the site and make recommendations regarding the treatment and disposition of the human remains and any associated grave goods. This should be conducted within 24 hours of their notification by the NAHC (PRC Section 5097.98[a]). If an agreement for treatment of the remains cannot be resolved satisfactorily, any of the parties may request mediation by the NAHC (PRC Section 5097.94[k]). Should mediation fail, the landowner or the landowner's representative must re-inter the remains and associated items with appropriate dignity on the property in a location not subject to further subsurface disturbance (PRC Section 5097.98[b]).

Through agreement on the treatment and disposition of human remains reached between the MLD and the California Department of Parks and Recreation with the assistance of the archaeologist, or through mediation by the NAHC, implementation of Mitigation Measure CR-2 would reduce potentially significant impacts associated with the discovery of human remains to a less-than-significant level.

Hydrology and Water Quality

Mitigation Measure HYDRO-1: Implement Erosion Control and Spill-Prevention Measures.

- ▶ *A variety of sediment control measures such as buffers or set backs from the river, silt fences, straw or rice bale barriers, brush or rock filters, sediment traps, fiber rolls, or other similar linear barriers will be placed at the edge of the project area to prevent sediment from flowing off site.*
- ▶ *The contractor will establish a spill-prevention and countermeasure plan before project construction begins; this plan will include on-site handling criteria to avoid input of contaminants to the waterway. A staging, washing, and storage area will be provided at least 100 feet away from the waterway for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants.*
- ▶ *No ground disturbing work will occur within the active channel of the Sacramento River.*
- ▶ *Only state and locally approved herbicides will be used on the restoration site.*
- ▶ *Herbicide applications will be prescribed by a state-licensed pest control advisor (PCA) and applied by state licensed applicators.*

Noise

Mitigation Measure N-1: Equip Construction Equipment with Noise Controls and Maintain according to Manufacturers' Specifications.

USFWS shall require construction contractors to ensure that, to the extent feasible, construction equipment shall be properly maintained and equipped with noise controls, such as mufflers, in accordance with manufacturers' specifications.

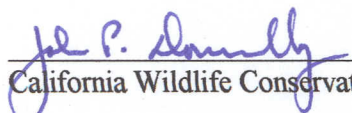
Mitigation Measure N-2: Limit Construction to Hours Permitted in Applicable Standards.

Construction operations involved with the proposed project shall be limited to the hours of 7 a.m.-7 p.m. Monday through Sunday, during which such activities are exempt from noise levels identified in the applicable standards.

Implementing Mitigation Measures N-1 and N-2 would ensure that noise impacts during construction would be reduced to a less-than-significant level.

A copy of the Initial Study is attached. Questions or comments regarding this proposed Mitigated Negative Declaration and Initial Study may be addressed to:

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California Wildlife Conservation Board
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Sacramento, CA 95811
Phone (916) 324-7487
Email: AChappelle@dfg.ca.gov


California Wildlife Conservation Board

12/8/05
Date

Statement of Approval (to be signed if the IS/MND is adopted and the project approved)

In accordance with Section 21082.1 of the California Environmental Quality Act, the California Wildlife Conservation Board has independently reviewed and analyzed the Initial Study and Mitigated Negative Declaration for the proposed project and finds that the Initial Study and Mitigated Negative Declaration reflect the independent judgment of the WCB. The lead agency further finds that the project mitigation measures will be implemented as stated in the Mitigated Negative Declaration.

I hereby approve this project:

California Wildlife Conservation Board

Date

Initial Study / Proposed Mitigated Negative Declaration Habitat Restoration of the Codora Unit on the Sacramento River National Wildlife Refuge



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December 9, 2008

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ABBREVIATIONS AND ACRONYMS

μPa	micropascals
ADT	average daily traffic
APNs	Assessor's Parcel Numbers
ARB	Air Resources Board
Caltrans	California Department of Transportation
CCP	Comprehensive Conservation Plan
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CLMA	Cooperative Land Management Agreement
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO ₂	carbon dioxide
CRHR	California Register of Historic Resources
CVFPB	Central Valley Flood Protection Board
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
dB	decibel
dB/DD	dB per doubling of distance
DFG	California Department of Fish and Game
EA	Environmental Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FMP	Fire Management Plan

FONSI	Finding of No Significant Impact
GCAPCD	Glenn County Air Pollution Control District
GHG	greenhouse gas
in/sec	inches per second
IS	Initial Study
LOS	Level of Service
MLD	Most Likely Descendant
MND	Mitigated Negative Declaration
mph	miles per hour
NAHC	Native American Heritage Commission
ND	Negative Declaration
NEPA	National Environmental Policy Act
NO _x	oxides of nitrogen
NRCS	Natural Resource Conservation Service
NSVAB	Northern Sacramento Valley Air Basin
PCA	pest control advisor
PPV	peak particle velocity
Refuge System	National Wildlife Refuge System
RHJV	Riparian Habitat Joint Venture
RM	River Mile
RMS	root mean square
ROG	reactive organic gases
SR	State highway
SRCAF	Sacramento River Conservation Area Forum
SRNWR	Sacramento River National Wildlife Refuge
TACs	toxic air contaminants
TNC	The Nature Conservancy

USACE	U.S. Army Corps of Engineer
USDA	US Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VdB	velocity decibels
VELB	valley elderberry longhorn beetle
VMT	vehicle miles traveled
WCB	California Wildlife Conservation Board

1 INTRODUCTION

1.1 OVERVIEW AND REGULATORY GUIDANCE

This document has been prepared by California Wildlife Conservation Board (WCB) to evaluate the potential environmental effects of the proposed habitat restoration project, located within the Codora Unit of the Sacramento River National Wildlife Refuge (SRNWR). This document has been prepared in accordance with the California Environmental Quality Act (CEQA) (Pub. Res. Code Section 21000 et seq.) and the State CEQA Guidelines (14 California Code of Regulations [CCR] Section 15000 et seq.).

An initial study (IS) is conducted by a lead agency to determine if a project may have a significant effect on the environment. In accordance with State CEQA Guidelines Section 15064(a), an environmental impact report (EIR) must be prepared if there is substantial evidence (such as the results of an IS) that a project may have a significant effect on the environment. A negative declaration (ND) or mitigated negative declaration (MND) may be prepared if the lead agency determines that the project would have no potentially significant impacts or that revisions made to the project, or agreed to by the applicant, mitigate the potentially significant impacts to a less-than-significant level (State CEQA Guidelines Section 15064[f]).

1.2 PREVIOUS ENVIRONMENTAL DOCUMENTS

1.2.1 SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE FINAL COMPREHENSIVE CONSERVATION PLAN

The SRNWR is located in the Sacramento Valley along 77 miles of the Sacramento River between Red Bluff and Princeton. The SRNWR is composed of 26 properties (Units) spread out along both sides of this stretch of river. The SRNWR preserves, restores and enhances riparian habitat for threatened and endangered species, neotropical migrants, waterfowl and other migratory birds, anadromous fish, and residential riparian wildlife and plants. The Sacramento River riparian community is one of the most important wildlife habitats in California and North America.

A Comprehensive Conservation Plan (CCP) for the SRNWR was completed in June 2005 (U.S. Fish and Wildlife Service [USFWS]) to provide a 15-year strategy for achieving the SRNWR purposes and contributing to the mission of the National Wildlife Refuge System. The National Wildlife Refuge System Improvement Act of 1997 requires that all National Wildlife Refuges be managed in accordance with an approved CCP by 2012. The USFWS prepared the CCP to meet the dual needs of complying with the Improvement Act and providing for long-term integrated management guidance for the SRNWR. The proposed project and management of the Codora Unit would be consistent with the SRNWR CCP (June 2005).

1.2.2 NEPA ENVIRONMENTAL ASSESSMENT

Because the project seeks to restore habitat on federal property, it is subject to the National Environmental Policy Act (NEPA), as amended, and its implementing regulations. The USFWS prepared a NEPA Environmental Assessment (EA) evaluating the environmental effects of three proposed project alternatives for managing the Codora Unit. A Draft EA was released for public comment on October 3, 2008. The public comment period has closed (October 3–November 17, 2008) and USFWS is preparing responses to comments on the Draft EA, which will be included in the Final EA. USFWS is expected to publish the Final EA with a “Finding of No Significant Impact” (FONSI) determination in early December 2008. This is part of the USFWS’ decision-making process in accordance with NEPA. The EA addressed only habitat enhancement and restoration activities on the project site and was not intended to provide in-depth discussions of related issues of concern, such as public use, which were

addressed in the Sacramento River National Wildlife Refuge Final Comprehensive Conservation Plan (June 2005).

Pursuant to State CEQA Guidelines Section 15221, for a project requiring both NEPA and CEQA environmental analyses, and where the NEPA EA/FONSI was prepared before the IS, the NEPA EA can be used to satisfy certain aspects of the CEQA requirements. Consistent with CEQA Guidelines Section 15221, information from the NEPA Draft EA has been used to prepare this IS, where the information complies with the provisions of CEQA. The NEPA Draft EA is included as Appendix A to this document.

1.3 LEAD AGENCY

Under CEQA, the lead agency is the public agency with primary responsibility over the proposed project. In accordance with State CEQA Guidelines Section 15051, the California Department of Fish and Game (DFG) WCB is the lead agency for the proposed project.

1.4 PURPOSE AND ORGANIZATION OF THE DOCUMENT

The purpose of this document is to evaluate the potential environmental effects of the proposed project. Mitigation measures have been incorporated to reduce or eliminate any potentially significant project-related impacts.

This document is organized as follows:

- ▶ **Proposed Mitigated Negative Declaration.** The proposed mitigated negative declaration (MND), which precedes the IS analysis, summarizes the environmental conclusions and identifies mitigation measures that would be implemented in conjunction with the proposed project. It would be signed by a representative of the lead agency if the project were approved.
- ▶ **Chapter 1: Introduction** provides an introduction and describes the purpose and organization of this document.
- ▶ **Chapter 2: Description of the Proposed Project** describes the purpose of and need for the proposed project, project objectives, and location and characteristics of the proposed project.
- ▶ **Chapter 3: Environmental Checklist** organized by environmental issue, provides an environmental setting (where appropriate) and evaluates a range of impacts classified as “no impact,” “less than significant,” “less than significant with mitigation incorporated,” or “potentially significant,” in response to the environmental checklist. Mitigation measures are incorporated, where appropriate, to mitigate potentially significant impacts to a less-than-significant level.
- ▶ **Chapter 4: Summary of Mitigation Measures** summarizes the mitigation measures proposed in the IS.
- ▶ **Chapter 5: References** contains information regarding the references used in preparing this IS/proposed MND.
- ▶ **Chapter 6: List of Preparers** identifies the people who prepared the document.

1.5 SUMMARY OF FINDINGS

Chapter 3 of this document contains the Environmental Checklist that identifies the potential environmental impacts (presented by environmental issue) and a brief discussion of each impact resulting from implementation of the proposed project. Based on the Environmental Checklist and the supporting environmental analysis

provided in this document, implementation of the proposed project would result in either no impact or less-than-significant impacts for the following issues:

- ▶ aesthetics,
- ▶ agricultural resources,
- ▶ geology and soils,
- ▶ hazards and hazardous materials,
- ▶ land use and planning,
- ▶ mineral resources,
- ▶ population and housing,
- ▶ public services,
- ▶ recreation,
- ▶ transportation/traffic, and
- ▶ utilities and service systems.

Implementation of the proposed project would result in less-than-significant impacts following mitigation for the following issues:

- ▶ air quality (construction-generated emissions),
- ▶ biological resources (disturbance to nesting birds),
- ▶ cultural resources (previously unknown resources and human remains),
- ▶ hydrology and water quality (sediment and erosion control), and
- ▶ noise (construction-related noise).

In accordance with State CEQA Guidelines Section 15064(f)(2), an MND shall be prepared if “the lead agency determines there is no substantial evidence in light of the whole record before the public agency that the project, as revised, may have a significant effect on the environment” after the implementation of mitigation measures. There is no substantial evidence that the proposed project may have a significant effect on the environment, based on the available project information and the environmental analysis presented in this document. Therefore, a proposed MND has been prepared in accordance with the State CEQA Guidelines.

1.6 PUBLIC REVIEW AND COMMENT

PREVIOUS PUBLIC REVIEW FOR THE NEPA ENVIRONMENTAL ASSESSMENT

The NEPA Draft EA was distributed on October 3, 2008 to interested individuals, organizations, and agencies for a 30-day comment period from October 3–November 17, 2008. The EA was available electronically on the USFWS’ website <http://sacramentovalleyrefuges.fws.gov> and a hardcopy was available at the USFWS office in Willows, CA. CD’s were also be provided upon request.

USFWS is preparing a Final EA, including responses to comments on the Draft EA, and is expected to publish the Final EA with a determination that an Environmental Impact Statement (EIS) was not necessary for the proposed project (i.e., adopting a Finding of No Significant Impact [FONSI]) in early December 2008.

PUBLIC REVIEW FOR THE CEQA DRAFT INITIAL STUDY

This IS/proposed MND is available for a 30-day public review period beginning December 9, 2008, and ending on January 8, 2009. Written comments may be submitted by 5:00 p.m. on January 8, 2009 to:

Anthony Chappelle, Riparian Restoration Program Manager
California Wildlife Conservation Board
1807 13th Street, Suite 103
Sacramento, CA 95811
Phone (916) 324-7487
Email: AChappelle@dfg.ca.gov

Copies of the IS/Proposed MND, along with documents referenced in the Initial Study, may be reviewed at the following locations during normal business hours:

- On line at: www.wcb.ca.gov
- California Wildlife Conservation Board, 1807 13th Street, Suite 103, Sacramento, CA 95811
- The Nature Conservancy, 500 Main Street, Chico, CA 95928
- Sacramento National Wildlife Refuge, 752 County Road 99W, Willows, CA 95928
- Colusa County Library, 232 Prince Street, Princeton, CA 95970
- Willows Public Library, 201 North Lassen Street, Willows, CA 95988
- Four Corners, 8071 County Road 61, Princeton, CA 95970

Your views and comments on how the project may affect the environment are welcomed.

2 DESCRIPTION OF THE PROPOSED PROJECT

2.1 INTRODUCTION

This Initial Study (IS) environmental checklist evaluates the potential environmental effects resulting from restoration of 274.5 acres of walnut orchard to riparian habitat on the U.S. Fish and Wildlife Service (USFWS)-owned Codora Unit of the Sacramento River National Wildlife Refuge (SRNWR), located at Sacramento River Mile (RM) 168.5–167.5 in Glenn County. The proposed restoration plan calls for mixed riparian forest, cottonwood riparian forest, valley oak savanna and grassland. The restoration would improve the ecological health and long-term viability of at-risk species and riparian communities along the Sacramento River by restoring riparian habitat and improving water quality through active restoration.

2.2 PROJECT LOCATION

The SRNWR is located in the Sacramento Valley of north-central California (Exhibit 2-1). The Sacramento Valley is bordered by the Sierra Nevada Range to the east and the Coast Range to the west. The SRNWR was established in 1989 and is currently composed of 26 units along a 77-mile stretch of the Sacramento River between the cities of Red Bluff and Princeton, 90 miles north of the metropolitan area of Sacramento.

The proposed project site is a 274.5-acre walnut orchard located within the 399-acre Codora Unit of the SRNWR. The Codora Unit is located along the western bank of the Sacramento River at river mile 168.5–167.5 (Exhibits 2-2 and 2-3). This Unit is located in Glenn County west of Butte City, between Colusa and Hamilton City at the intersection of state highways 162 and 45. The project site is located in the Beehive Bend subreach (RM 178–164) between the Sul Norte and Packer Lake Units of the Sacramento River NWR (Exhibit 2-4). The assessor's parcel numbers (APNs) for the site are 013-180-17 and 013-140-19. The Codora Unit is bounded on the east by the Sacramento River, and bounded on the south, west and north sides by USFWS properties. The 274.5-acre project site is surrounded by restored and remnant riparian habitat, primarily cottonwood riparian forest and valley oak forest (Exhibit 2-3).

The Codora Unit was acquired by UFSWS as part of the SRNWR in 1994. The change in land use from agriculture to riparian habitat was approved at the time of acquisition; however, the site has remained in agricultural production with the understanding that it will eventually be restored to native habitats. The Unit's 274.5 acres of walnut are currently managed under a Cooperative Land Management Agreement (CLMA) with The Nature Conservancy (TNC) and leased to a tenant farmer. However, no trees have been replanted in the last ten years, and the orchard is losing productivity. Currently, the orchard is at less than 65% of its original productivity, especially because of unhealthy and lost trees.

2.3 PROJECT BACKGROUND

2.3.1 U.S. FISH AND WILDLIFE SERVICE AND NATIONAL WILDLIFE REFUGE SYSTEM

The mission of USFWS is working with others to conserve, protect, and enhance the nation's fish and wildlife and their habitats for the continuing benefit of the American people. USFWS is the primary federal agency responsible for migratory birds, endangered plants and animals, certain marine mammals, and anadromous fish. This responsibility to conserve our nation's fish and wildlife resources is shared with other federal agencies and state and tribal governments.

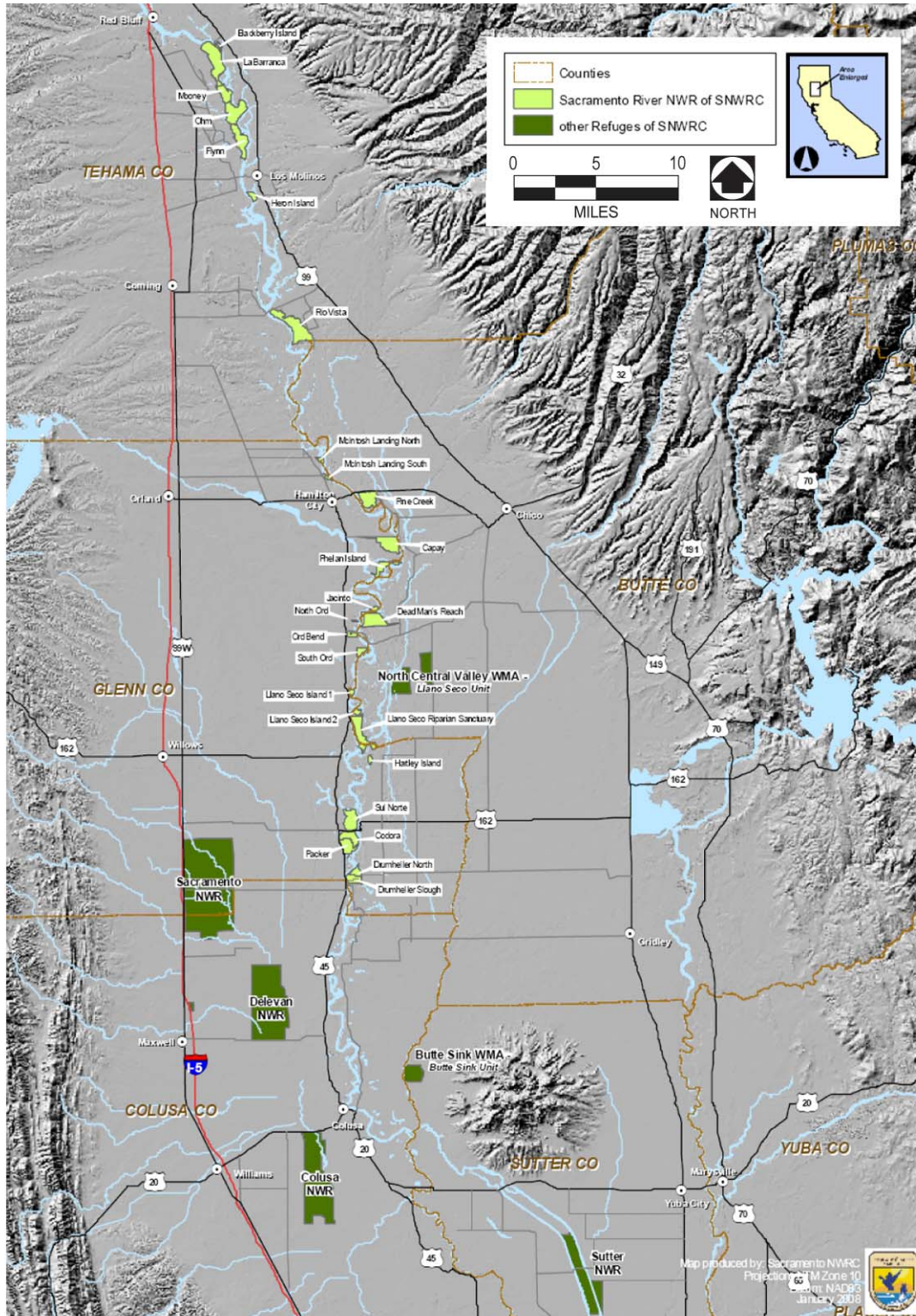


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Source: Adapted by EDAW 2008

Project Location

Exhibit 2-1

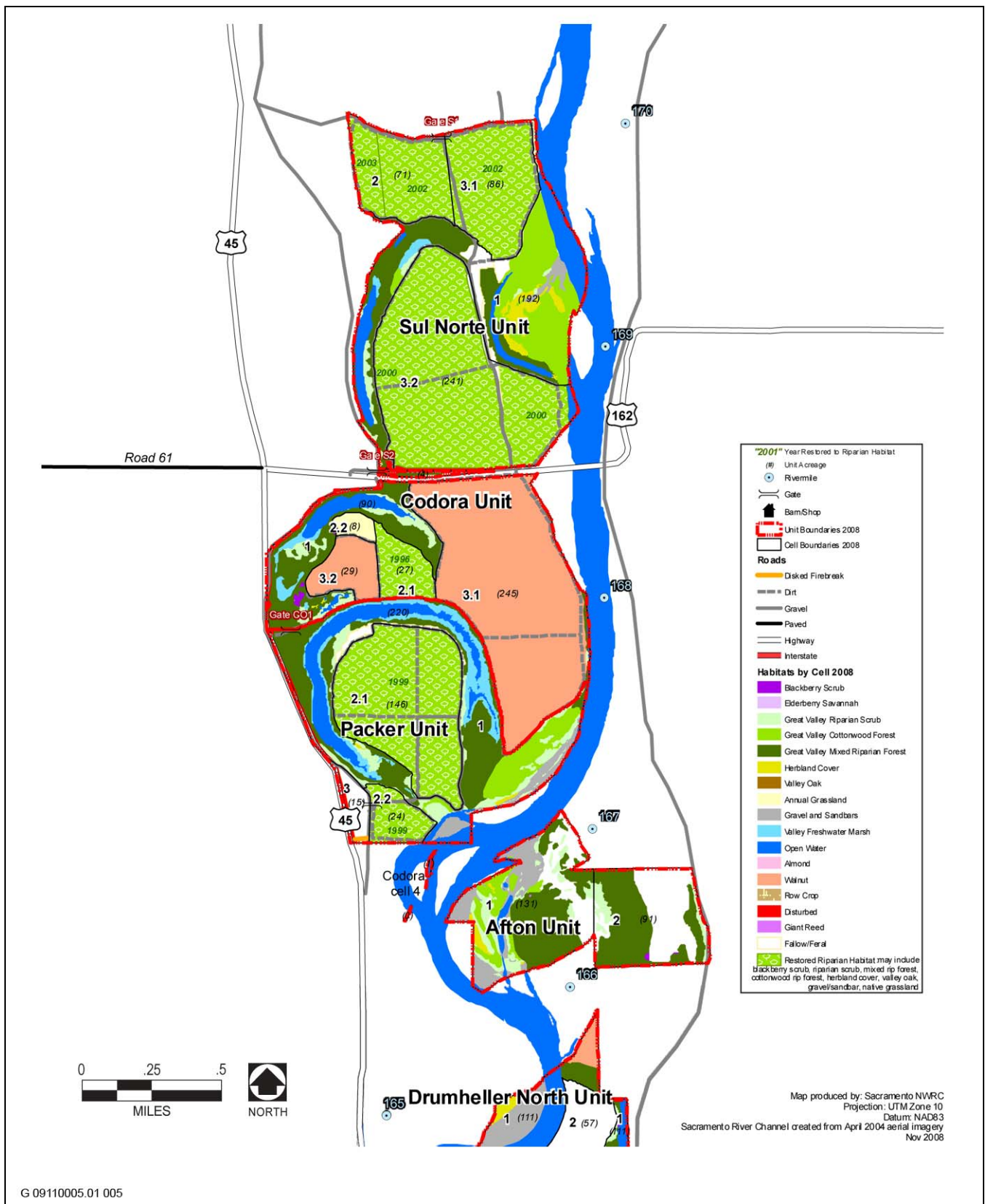


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Source: Adapted by EDAW 2008

Sacramento National Wildlife Refuge

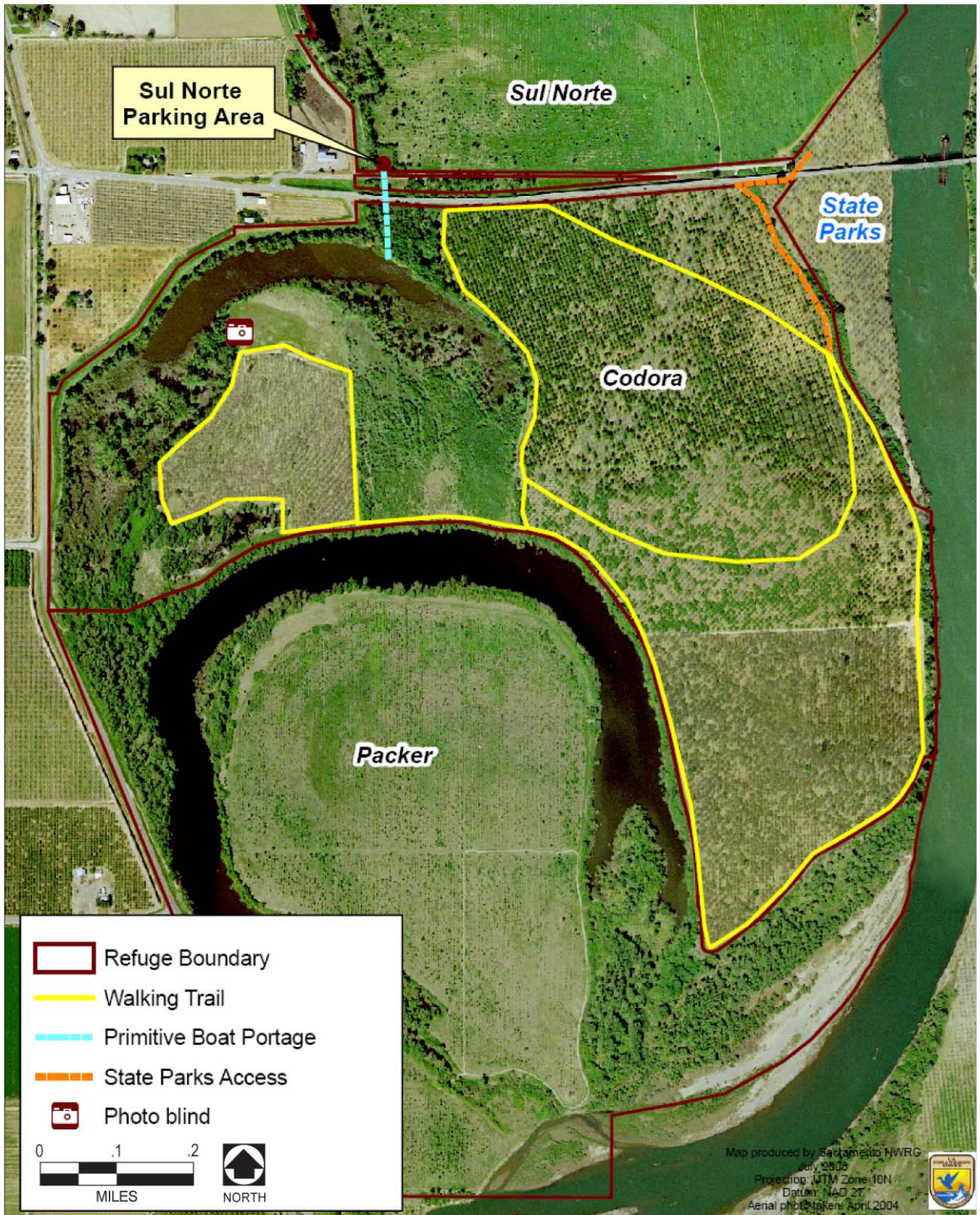
Exhibit 2-2



Source: Adapted by EDAW 2008

Existing Habitats On and Around the Codora Unit

Exhibit 2-3



G 09110005.01 004

Source: Adapted by EDAW 2008

Visitor Service Opportunities on the Codora Unit

Exhibit 2-4

As part of this responsibility, USFWS manages the National Wildlife Refuge System (Refuge System). The Refuge System is the only nationwide system of federal lands managed and protected for wildlife and their habitats. The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The SRNWR is managed as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 as amended by the Improvement Act, and other relevant legislation, executive orders, regulations, and policies.

2.3.2 SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE

The SRNWR purposes are:

...to conserve (A) fish or wildlife which are listed as endangered species or threatened species....or (B) plants..." 16 U.S.C. Sec. 1534 (Endangered Species Act of 1973).

...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." 16 U.S.C. 3901(b) (Emergency Wetlands Resources Act of 1986).

...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 U.S.C. 742f (a) (4) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 U.S.C. Sec. 742f (b) (1) (Fish and Wildlife Act of 1956).

A Comprehensive Conservation Plan (CCP) for the SRNWR was completed in June 2005 (USFWS). The CCP guides management of the SRNWR for the next 15 years. Compatible recreation opportunities in the SRNWR identified in the CCP include hunting, fishing, hiking, wildlife observation, environmental education, and nature interpretation.

IMPORTANCE OF RIPARIAN HABITAT

The Sacramento River is a fundamental state water source that drains 24,000 square miles of the northern Central Valley and supplies 80% of freshwater flowing into the Bay-Delta (CA State Lands Commission 1993). Historically, the river was lined by approximately 800,000 acres of riparian forest (Katibah 1984). Over 95% of this habitat has been lost, however, to selective logging, agriculture, urban development, and flood control and power generation projects. Cumulatively, these changes have greatly stressed the Sacramento River and associated species. The loss and degradation of riparian habitat has greatly diminished the river's ability to support viable wildlife populations and encouraged the invasion and proliferation of non-native invasive species. Two-thirds of the linear extent of the river's banks have been modified and confined by levees and riprap. Channelization, bank protection, and the construction of the Shasta Dam degraded riparian habitat along the Sacramento River by restricting the dynamic forces that promote natural habitat succession and regeneration.

Healthy riparian habitats contain a great number of flora and fauna because of the range of community types, overall structural diversity, availability of water and soil moisture, potential as corridors for migration, and critical breeding grounds (California State Lands Commission 1993, California Resources Agency 2000). Additionally, riparian corridors provide two primary functions essential to maintaining water quality: 1) moderating stream temperature and 2) reducing sediments and nutrients emanating from upland agriculture (Castelle et al. 1994). The loss of high-quality habitat and the decrease in water quality along the Sacramento River has caused many native species populations to become critically endangered. Important at-risk species include the Sacramento splittail, green sturgeon, Chinook salmon, steelhead trout, western yellow-billed cuckoo, Swainson's hawk, least

Bell's vireo, and VELB (CALFED 2000) (River Partners 2004). Several recently published papers (Gardali et al. 2006, Golet et al. 2008) provide clear evidence that Sacramento River restoration sites provide positive benefits to neotropical landbirds, as well as resident birds and other species.

Although severely degraded, the Sacramento River is still the most diverse and extensive river ecosystem in California (California State Lands Commission 1993). In an effort to improve ecosystem health in the region, federal, state, and local governments, as well as non-government organizations, have begun to implement a series of ecosystem restoration programs along the river. In 1986, the California State Legislature passed Senate Bill 1086, which mandated the development of a management plan for the Sacramento River and its tributaries to protect, restore, and enhance fisheries and riparian habitat (California Resources Agency 2000). The Sacramento River Conservation Area Forum (SRCAF) non-profit organization formed and set as its primary goal the preservation of remaining riparian habitat and reestablishment of a continuous riparian corridor along the Sacramento River from Red Bluff to Colusa.

2.4 PURPOSE OF THE PROPOSED PROJECT

The purpose of the proposed project is to restore riparian and associated habitats within the Codora Unit in a flood neutral manner to help fulfill USFWS' congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants.

2.4.1 SHORT-TERM OBJECTIVE

The short-term goal for the project is to plant a diverse mosaic of riparian communities on 274.5 acres. Exotic weeds inhibit seedling establishment of native riparian vegetation and a diminished flood disturbance regime limits natural establishment of floodplain riparian communities; therefore, it is necessary to conduct active horticultural restoration such as planned for the Codora Unit (Peterson 2002). Restoration on this site would facilitate the establishment of native riparian habitat that without active cultivated restoration would return to native vegetation at a very slow rate or not return at all.

2.4.2 LONG-TERM OBJECTIVES

The long-term goal of the project is to improve the ecological health and long-term viability of at-risk species and riparian communities along the Sacramento River by restoring riparian habitat and improving water quality through active horticultural restoration.

Based on the ecological conditions found in naturally occurring riparian forests along the Sacramento River from Red Bluff to Colusa, the ecological objectives for this site are:

- ▶ establish early and late successional stage riparian communities which have been severely reduced in extent along the Sacramento River since 1850,
- ▶ provide habitat for neo-tropical migrant land birds,
- ▶ provide habitat for the valley elderberry longhorn beetle (VELB), and
- ▶ improve water quality by decreasing sediment and pesticide runoff into the Sacramento River.

2.4.3 MANAGEMENT OBJECTIVES

The management objectives, which are implementation standards for achieving the ecological objectives, are:

- ▶ meet, or exceed, a survival rate of at least 80% planted woody plants by December 2012; and
- ▶ meet, or exceed, herbaceous density of 80% or greater by December 2012.

2.5 PROJECT DESCRIPTION

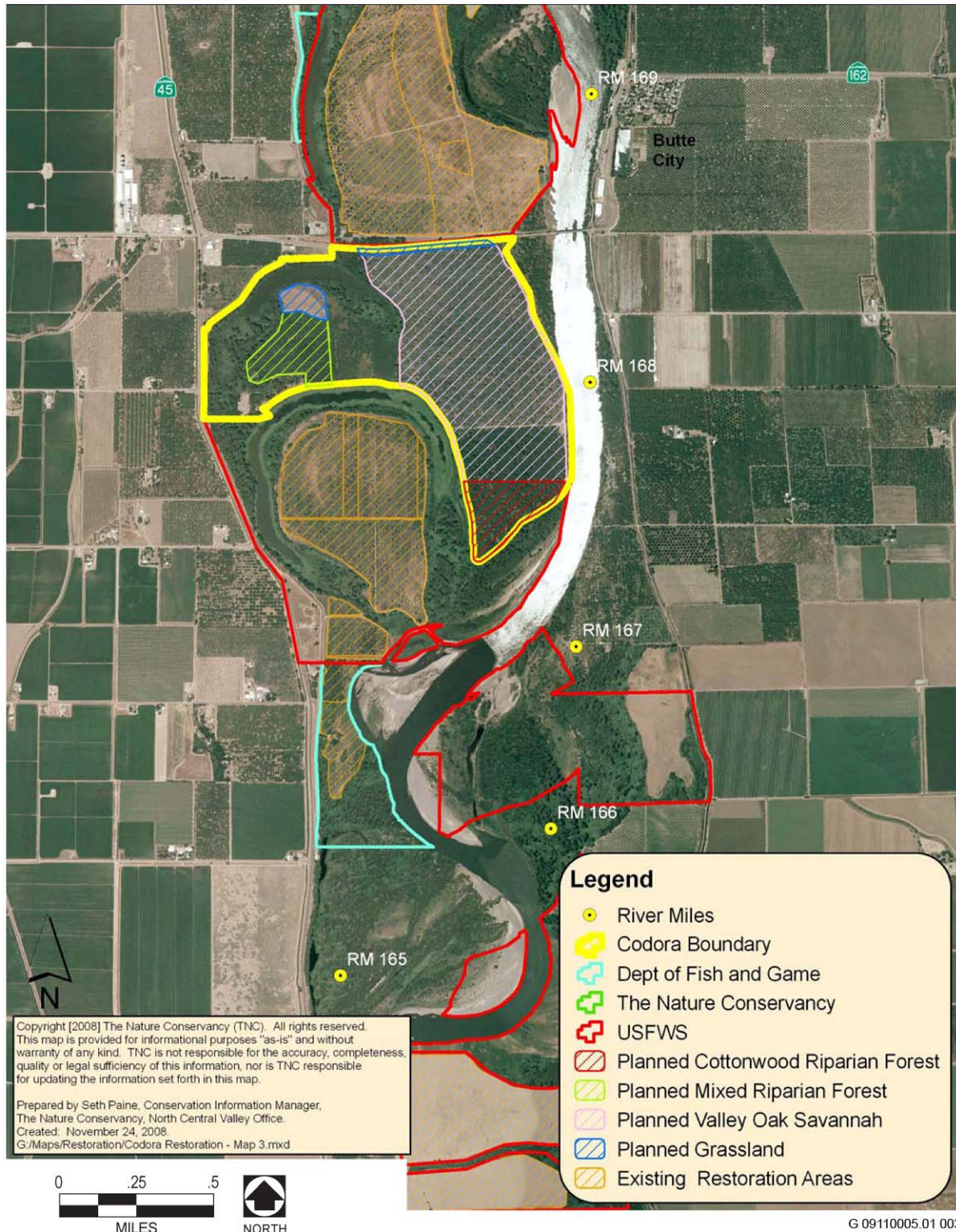
The proposed project calls for the active restoration of 274.5-acres of the Codora Unit, which is currently used for walnut production, to 208 acres of valley oak savanna, 28.5 acres of mixed riparian forest, 30 acres of cottonwood riparian forest, and 8 acres of grassland (Exhibit 2-5). A Riparian Habitat Restoration Plan, developed by TNC (2008) (Appendix B), describes a specific restoration design based on the environmental conditions and ecological goals on the Codora Unit. A variety of plant communities (vegetation types) are used because various trees, shrubs, vines, and herbaceous plants are adapted to the different physical site conditions. Important site conditions include, soil texture and chemistry, depth to the water table, depth the refusal (i.e., gravel) where root penetration is not possible because of lack of water, and flood frequency. Planting appropriate species according to these ecological conditions results in sites within the restoration of various species composition, various frequencies of the selected plant species, and various planting densities: all of these variables combine to define the type of vegetation, or plant community.

The restoration plan is consistent with the Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge (USFWS 2002), the Final CCP for the Sacramento River National Wildlife Refuge (USFWS 2005), and the results of the Beehive Bend Hydraulic Modeling report (Ayers Associates 2001, 2005, 2007) (Appendix C). The communities planned for habitat restoration are based on site assessments of the soil profile, topography, flood frequency and hydraulic modeling, depth to groundwater at base flows, weed community, and existing riparian community. The Codora Unit floods every 1 to 5 years with the 274.5-acre orchard in the 4-year estimated flood frequency interval (California Department of Water Resources 1994) (Exhibit 2-6).

The proposed restoration plan (Appendix B) took into consideration the flood control features of the Sacramento River. An iterative design approach was used in a joint effort of TNC ecologists and Ayers Associates engineers (Appendix C) to achieve a restoration design that is flood neutral. The appropriate vegetative communities were designed based on the existing vegetation, soil types and availability of groundwater so that no higher hydraulic friction would naturally occur. Specifically, the 208 acres of valley oak savanna habitat would serve as an essential flood corridor because of its low tree density. The restoration design achieves flood neutrality with water surface elevations either being slightly reduced or remaining the same compared to current conditions.

The 274.5-acre restoration would improve the ecological health and long-term viability of at-risk species and riparian communities along the Sacramento River by restoring riparian habitat and improving water quality through active restoration. Restoration on this site facilitates the establishment of native riparian habitat that, without active cultivated restoration, would return to native vegetation at a very slow rate or not return at all. Restoring riparian habitat in the area would improve habitat for fish and wildlife by creating a large continuous block of habitat. Fish benefit from riparian areas that become flooded at high flows, where floodwaters are relatively slower and warmer than the main channel and provide refugia for young and juvenile fish. Additionally, large woody debris, a result of increased riparian habitat, provides food and cover for critical life stages of anadromous fish. Additionally, restored riparian forests would buffer and filter toxic and organic matter that originate further away from the river, thereby further enhancing water and sediment quality.

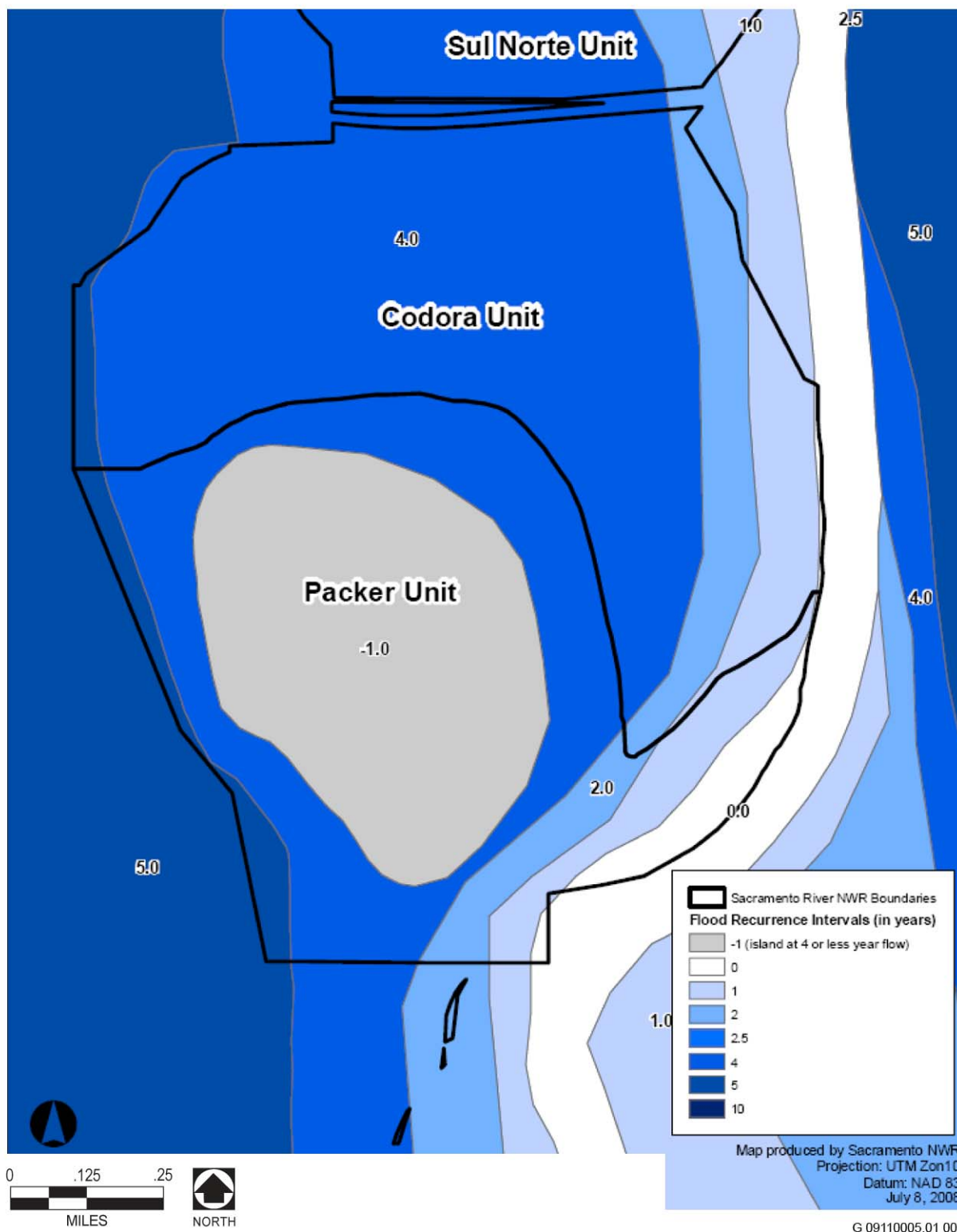
The CCP for the Sacramento River Refuge (USFWS 2005) identifies the need to work with federal, state, county, levee and irrigation districts to investigate best management practices for habitat, water diversion, and flood management projects through technical studies and agency coordination. Accordingly, the SRNWR has implemented a self-imposed, 100-foot blue elderberry shrub-free zone intended to buffer the boundaries between SRNWR restoration sites and private orchards, levees, and roadways so that agricultural pesticide drift from those neighboring private orchards and facility and levee maintenance operations would not affect VELB habitat in restoration sites or adjacent landowner operations. The SRNWR has coordinated and worked with the local levee



Source: Adapted by EDAW 2008

Proposed Riparian Habitat Restoration Plan

Exhibit 2-5



Source: Adapted by EDAW 2008

Flood Recurrence Intervals

Exhibit 2-6

districts to maintain 20–30 foot vegetation-free areas where appropriate along the borders with private lands and adjacent to the U.S. Army Corps of Engineer (USACE) levees. Construction and maintenance of vegetation firebreaks on all Refuge property bordering USACE is incorporated as “high” priority projects described in the Annual Habitat Management Plans for the Sacramento River Refuge. No woody species, including elderberries, would be planted within 100 feet of the Butte City Causeway to allow for vegetation control adjacent to the CalTrans Bridge structure. There is existing remnant vegetation along the Sacramento River Flood Control levees therefore this project will not include planting any vegetation adjacent to the levee on the western boundary of the Codora Unit.

USFWS would be responsible for long-term management of the Codora Unit according to the Final CCP (June 2005) for the SRNWR. The CCP states that, upon completion of the restoration project, the Codora Unit would eventually be open to five priority uses (fishing, wildlife observation, photography, interpretation, and environmental education), while remaining closed to hunting. Future access to the Codora Unit would be provided via hiking trails linked to the existing parking area and pedestrian gate on the adjacent Sul Norte Unit. However, the five priority uses would be deferred until agricultural operations have ceased and restoration has been established.

2.5.1 HABITAT ESTABLISHMENT AND MAINTENANCE

TNC staff would implement the proposed habitat restoration, including overseeing plant materials collection and propagation, site preparation and layout, planting, maintenance, monitoring, and reporting to the USFWS and WCB during the 3-year restoration implementation phase of the project.

Plant collection and propagation as well as orchard removal and field preparation would commence in spring 2009. Orchard removal would include removal of the walnut trees, including excavating the root balls, mowing, tilling with tractors and application of herbicide. The orchard trees would be chipped on site and the biomass would be hauled away to a cogeneration plant. The existing solid set irrigation system would be converted to a microdrip irrigation system in fall 2009 and spring 2010 for use during the plant establishment phase. To eradicate non-native plants, repeat application of herbicides and mowing would be used. In spring 2010, the layout, overstory planting and understory planting would occur. The plants would be hand planted. In fall 2010, or fall 2011, depending on weed control success, the understory seeding would occur, completing the field work portion of project implementation. Maintenance of the restoration area (irrigation and weed control) is scheduled to follow directly after plantings (spring 2010) and would continue through fall 2012. Monitoring would occur throughout the entire 3-year implementation phase of the project. Annual reports would be provided by TNC to USFWS in winter 2010, 2011, and 2012. The implementation phase would be completed by December 2012, at which time USFWS would manage the Codora Unit according to the Final CCP (June 2005) for the SRNWR, as described above.

3 ENVIRONMENTAL CHECKLIST

PROJECT INFORMATION	
1. Project Title:	Habitat Restoration of the Codora Unit within the Sacramento River National Wildlife Refuge (SRNWR)
2. Lead Agency Name and Address:	State of California Wildlife Conservation Board 1807 13th Street, Suite 103 Sacramento, CA 95811
3. Contact Person and Phone Number:	Anthony Chappelle, Riparian Restoration Program Manager Phone (916) 324-7487 Email: AChappelle@dfg.ca.gov
4. Project Location:	The proposed project site is a 274.5-acre walnut orchard located within the 399-acre Codora Unit of the SRNWR. The Codora Unit of the Sacramento River National Wildlife Refuge is located on the western bank of the Sacramento River at river mile (RM) 168.5-167.5. The Unit is in Glenn County, west of Butte City between Colusa and Hamilton City at the intersection of state highways 162 and 45. The Unit is located in the Beehive Bend Subreach (RM 178-164) between the Sul Norte and Packer Lake Units of the Sacramento River National Wildlife Refuge. The assessor's parcel numbers (APNs) for the site are 013-180-17 and 013-140-19.
5. Project Sponsor's Name and Address:	Ryan Luster The Nature Conservancy 500 Main Street Chico, CA 95928 530-897-6370 x213
6. General Plan Designation:	The Glenn County General Plan currently lists the Codora Unit as "Agriculture & Resource Lands." However, it should be noted that the Glenn County General Plan is undergoing revision and their "preferred alternative" version lists Codora as "Public Facilities & Open Space."
7. Zoning:	AE-40 (Exclusive Agricultural Zone, 36 acre minimum)
8. Description of Project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)	See Chapter 2 for a complete description of the proposed project.
9. Surrounding Land Uses and Setting: (Briefly describe the project's surroundings)	The SRNWR is bordered by private lands, as well as Federal and State owned public lands. Private lands are mostly agricultural (orchard, row crops, rice), with some private duck hunting clubs, farmsteads, trailer parks and isolated homes. The Codora Unit is bounded on the east by the Sacramento River, and the south, west and north by USFWS property. The 274.5-acre project site is surrounded by 126 acres of existing remnant habitat, primarily cottonwood riparian forest and valley oak forest.

PROJECT INFORMATION

10: Other public agencies whose approval is required:
(e.g., permits, financing approval, or participation agreement)

National Environmental Policy Act (NEPA)

The U.S. Fish and Wildlife Service (USFWS) distributed a Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the proposed project on October 3, 2008. The NEPA Draft EA was distributed on October 3, 2008 to interested individuals, organizations, and agencies for a 30-day comment period from October 3–November 17, 2008. The EA was available electronically on the USFWS' website <http://sacramentovalleyrefuges.fws.gov> and a hardcopy was available at the USFWS office in Willows, CA. CD's were also be provided upon request.

USFWS is preparing a Final EA, including responses to comments on the Draft EA, and is expected to publish the Final EA with a determination that an Environmental Impact Statement (EIS) was not necessary for the proposed project (i.e., adopting a Finding of No Significant Impact [FONSI]) in early December 2008.

Pesticide Use Permits

The Nature Conservancy will follow all of Glenn County's requirements, Department of Pesticide Regulation's requirements and the USFWS Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area.

Encroachment Permit

The proposed project is to be conducted on USFWS property and therefore it is not required to obtain a floodplain encroachment permit from the Central Valley Flood Protection Board (CVFPB). However, the USFWS will provide the CVFPB with a copy of the proposed restoration plan for their review.

The CVFPB requires that the project proponent demonstrate that the planting will not negatively impact the conveyance of flood flows by increasing the level of flow beyond that which was projected for the flood control system. Two-dimensional hydraulic modeling has been developed to demonstrate compliance with this standard.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

- | | | |
|--|---|--|
| <input type="checkbox"/> Aesthetics | <input type="checkbox"/> Agriculture Resources | <input type="checkbox"/> Air Quality |
| <input type="checkbox"/> Biological Resources | <input type="checkbox"/> Cultural Resources | <input type="checkbox"/> Geology / Soils |
| <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Hydrology / Water Quality | <input type="checkbox"/> Land Use / Planning |
| <input type="checkbox"/> Mineral Resources | <input type="checkbox"/> Noise | <input type="checkbox"/> Population / Housing |
| <input type="checkbox"/> Public Services | <input type="checkbox"/> Recreation | <input type="checkbox"/> Transportation / Traffic |
| <input type="checkbox"/> Utilities / Service Systems | <input type="checkbox"/> Mandatory Findings of Significance | <input checked="" type="checkbox"/> None With Mitigation |

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation:

I find that the proposed project **COULD NOT** have a significant effect on the environment, and a **NEGATIVE DECLARATION** will be prepared. ☐

I find that although the proposed project **COULD** have a significant effect on the environment, there **WILL NOT** be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **MITIGATED NEGATIVE DECLARATION** will be prepared. ☒

I find that the proposed project **MAY** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** is required. ☐

I find that the proposed project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier **EIR** or **NEGATIVE DECLARATION** pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier **EIR** or **NEGATIVE DECLARATION**, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required. ☐

Signature

Date

Printed Name

Title

Agency

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except “No Impact” answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A “No Impact” answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A “No Impact” answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. “Potentially Significant Impact” is appropriate if there is substantial evidence that an effect may be significant. If there are one or more “Potentially Significant Impact” entries when the determination is made, an EIR is required.
4. “Negative Declaration: Less Than Significant With Mitigation Incorporated” applies where the incorporation of mitigation measures has reduced an effect from “Potentially Significant Impact” to a “Less Than Significant Impact.” The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from “Earlier Analyses,” as described in (5) below, may be cross-referenced).
5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
 - a) Earlier Analysis Used. Identify and state where they are available for review.
 - b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
 - c) Mitigation Measures. For effects that are “Less than Significant with Mitigation Measures Incorporated,” describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project’s environmental effects in whatever format is selected.
9. The explanation of each issue should identify:
the significance criteria or threshold, if any, used to evaluate each question; and
the mitigation measure identified, if any, to reduce the impact to less than significance.

3.1 AESTHETICS

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I.	Aesthetics. Would the project:				
a)	Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b)	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d)	Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

- a) **Less-than-Significant Impact.** The project site does not provide scenic vistas. Both parcels are relatively level and are occupied by walnut orchards that obscure long-range views. The project site provides views of the Sacramento River and associated riparian habitat.

The land use and vegetation on the project site would change from walnut orchard to riparian habitat. Views of the project site would change from orchards to riparian vegetation, but views of adjacent riparian habitat and the Sacramento River would remain the same. Additionally, the restoration of the site to riparian habitat would result in a visual character/quality that is consistent with the surrounding USFWS lands in the Sul Norte and Packer Units of the SRNWR. Therefore, the proposed project would result in a less-than-significant impact related to scenic vistas.

- b) **No Impact.** There are no designated state scenic highways on or near the project site. The nearest highways to the project site are State highways (SR) 45 and 162, neither of which are designated as state scenic highways. Therefore, the project would not result in an impact to scenic resources within a state scenic highway.
- c) **Less-than-Significant Impact.** Temporary impacts to the visual character and quality of the site would occur because of removal of the walnut orchard and site preparation for the habitat restoration project. However, after the restoration of riparian habitat on the project site, the visual character of the site would be restored. The riparian habitat would be compatible with adjacent riparian habitat and the park-like character throughout the adjacent SRNWR. The change in visual character of the project site is considered a less-than-significant impact.
- d) **No Impact.** The proposed riparian habitat restoration project would not involve land development activities (i.e. residential subdivisions, or commercial or industrial land uses) or the installation of structures or facilities that would require or result in materials that generate glare or the need for nighttime lighting. Therefore, the proposed project would not result in new sources of substantial light or glare and the project would not adversely affect day or nighttime views in the area.

3.2 AGRICULTURAL RESOURCES

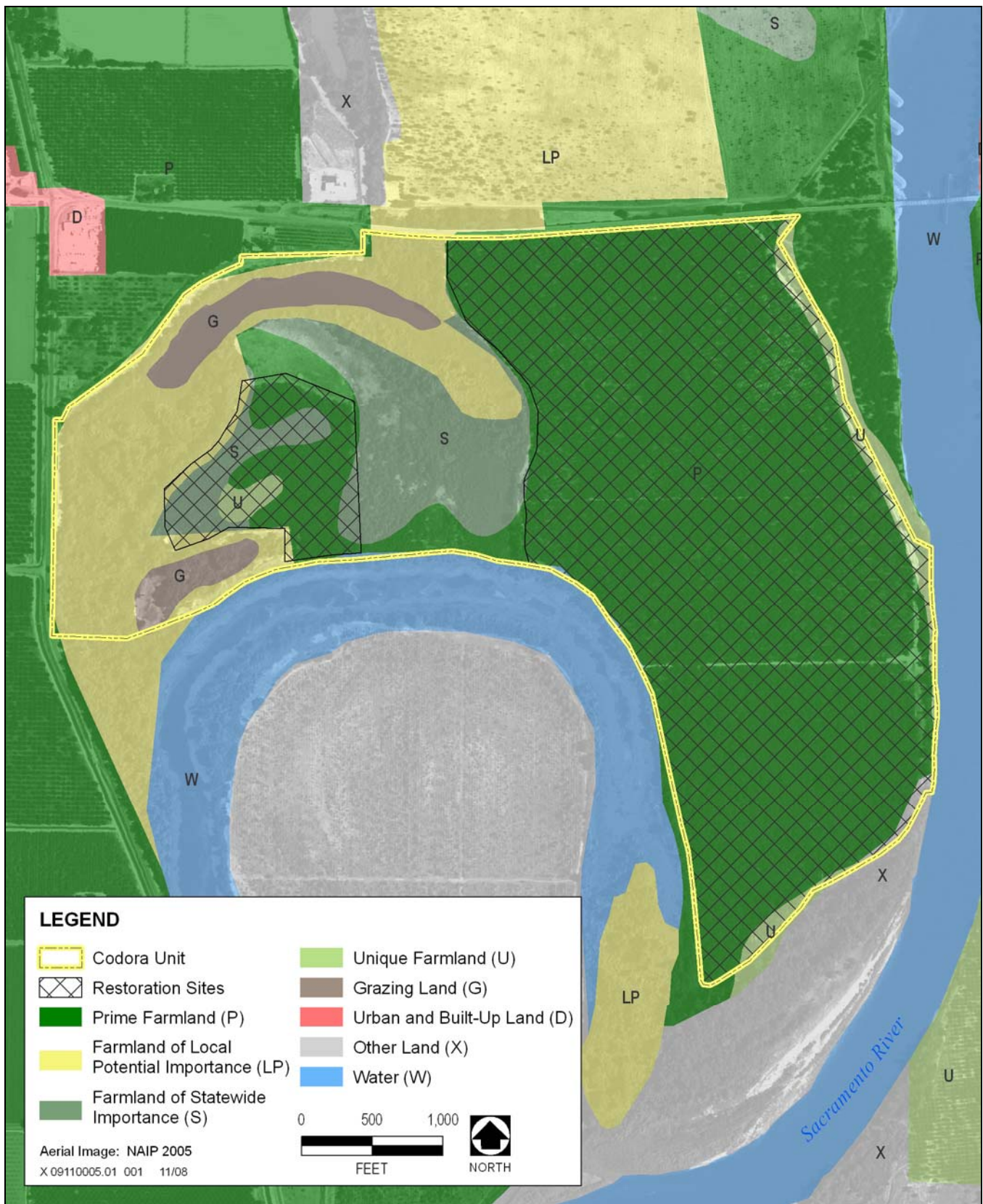
ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
II. Agricultural Resources.					
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997, as updated) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland.					
Would the project:					
a)	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b)	Conflict with existing zoning for agricultural use or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

DISCUSSION

- a) **Less-than-Significant Impact.** As shown on Exhibit 3-1, the entire 274.5-acre project site (APNs 013-180-17 and 013-140-19) is designated as prime farmland, farmland of statewide importance, farmland of local potential importance, and unique farmland by the California Department of Conservation (2006). The proposed project would restore 274.5 acres of walnut orchards to riparian habitat (i.e., non-agricultural uses). Restoration of natural vegetation, unlike urban development, would represent a return to the land's original (natural) physical condition and processes. This habitat restoration results in restoration of long-term natural functions and benefits including the original processes that first provided the soil qualities needed for the site's agricultural resource value.

Fully functioning riparian ecosystems are also known to improve groundwater and surface water quality by removing undesirable constituents such as nutrients and pesticides. Ceasing agricultural practices and restoring the project site could benefit adjacent and downstream agricultural lands by diminishing the volume and frequency of pesticides applied to the properties when compared with current conditions; slowing the loss of soils from the site onto adjacent or downstream locations; and by increasing groundwater levels.

Because the resource value of the soil is tied directly to the natural conditions and processes that existed before commercial agricultural cultivation, restoration of native riparian habitats would be preserving (and possibly improving over time) the soil integrity and the agricultural value of the soil (Cannon 2004, Tilman et al. 1996 and 2002). Therefore, the habitat restoration component of the proposed project would have a less-than-significant impact on agricultural resources.



Source: FMMP 2006

Important Farmland Map

Exhibit 3-1

Furthermore, the displacement of agricultural production because of orchard removal on the Codora Unit would not represent a substantial loss of crop production value to Glenn County. The SRNWR is committed to implementing restoration in phases, with older, less productive orchards targeted for restoration earlier. Although implementation of the proposed action would eliminate agricultural production on 274.5 acres of land along the Sacramento River, this land contains an orchard that is coming to the end of its productivity.

Although the lands included within the SRNWR are federally owned and therefore provide no property taxes, several factors help to mitigate this loss of revenue to local governments. First, SRNWR lands and waters demand little in the way of expensive infrastructure or services. Second, when USFWS acquires private land in fee title, Congress allocates payments to counties under the Refuge Revenue Sharing Act to partially compensate for the loss of property taxes. In addition, the restoration of the site to riparian habitat and the protection within SRNWR contribute to the local economy by drawing visitors from outside the county to the area for wildlife viewing, environmental interpretation, and other ecotourism related activities, which may result in the purchase of goods from local businesses and the associated sales tax to local governments.

- b) **No Impact.** The project lands are not held under a Williamson Act contract. The project site is zoned AE-40 (Exclusive Agricultural Zone, 36 acre minimum). The existing Glenn County General Plan lists the Codora Unit as “Agriculture & Resource Lands.” However, it should be noted that the Glenn County General Plan is currently undergoing revision, the “preferred alternative” version lists Codora as “Public Facilities & Open Space.”

The project site was purchased by USFWS in 1994 and the prospective change in land use from agriculture to riparian habitat was approved previously. The site has remained in walnut production with the understanding that it would eventually be restored to native habitats. No additional changes are proposed as part of the restoration program. The existing walnut orchard is also becoming less productive, since phasing out of the orchard began 14 years ago. Currently, the orchard is at less than 65 percent of its original productivity. Along with a general policy regarding the protection of agricultural land, Glenn County also promotes protection and improvement of natural areas for the benefit of wildlife and calls for early consultation with wildlife agencies on all projects. The proposed action is consistent with these land use policies relating to natural habitat protection. Furthermore, in February of 2008, the Glenn County Board of Supervisors voted to support the request for California River Parkways funding for the Codora Unit restoration. Therefore, the proposed habitat restoration would not conflict with existing land use designations or a Williamson Act contract.

- c) **Less-than-Significant Impact.** The proposed project would not involve land development activities (i.e. residential subdivisions, or commercial or industrial land uses) that would directly or indirectly induce changes in the use of surrounding agricultural land, such as the need for schools, public services, utility infrastructure, etc. The proposed project would restore native riparian habitats within the SRNWR, consistent with the mission of the SRNWR mission and the surrounding native and restored riparian habitats within SRNWR. There are a few potential effects on neighboring agricultural properties, such as loss occurring in the form of crop depredation from birds, rodents or mammals inhabiting newly planted riparian habitat. However, the proposed restoration areas within the Codora Unit are already bordered on all sides by existing habitat already in SRNWR ownership, so any effects on surrounding properties would be minimal. Additionally, because the northern border of the restoration site is bordered by SR 162, no trees or shrubs are to be planted within 100 feet of the causeway. Only native grasses will be established within 100 feet of the highway. For these reasons, the project would not result in changes to the existing environment that would result in the conversion of farmland to non-agricultural uses.

3.3 AIR QUALITY

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
III. Air Quality.					
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the following determinations.					
Would the project:					
a)	Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d)	Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e)	Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

DISCUSSION

a,b,c) Less than Significant with Mitigation Incorporated. The Codora Unit lies within the Northern Sacramento Valley Air Basin (NSVAB) and is under the jurisdiction of the Glenn County Air Pollution Control District (GCAPCD). The NSVAB is bounded on the north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada Mountains. These mountain ranges provide a substantial physical barrier to locally created pollution, as well as that transported northward on prevailing winds from the Sacramento Metropolitan area. The valley is often subjected to inversion layers that, coupled with geographic barriers and high summer temperatures, create a high potential for air pollution problems.

Glenn County is currently designated as a nonattainment-transitional and unclassified/attainment area for the state and federal ozone ambient air quality standards, respectively. Glenn County is designated as a nonattainment area with respect to the state PM₁₀ (i.e., respirable particulate matter with an aerodynamic diameter of 10 micrometers or less) standard, and is unclassified for the federal PM₁₀ and for the state and federal PM_{2.5} (i.e., respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less) standards (ARB 2008a).

Air quality within Glenn County is regulated by such agencies as the U.S. Environmental Protection Agency (EPA), and California Air Resources Board (ARB) at the federal and state levels, respectively, and locally by the GCAPCD. The GCAPCD establishes policies, regulations, and permit procedures and

monitors air quality parameters within Glenn County. The GCAPCD has not established quantitative thresholds of significance for the purposes of CEQA.

Short-Term Construction Emissions

Construction emissions are described as “short-term” or temporary in duration and have the potential to cause a significant impact with respect to air quality, especially fugitive dust emissions. Fugitive dust emissions are primarily associated with site preparation and vary as a function of such parameters as soil silt content, soil moisture, wind speed, acreage of disturbance area, and vehicle miles traveled (VMT) by construction vehicles on- and off-site. Reactive organic gases (ROG) and oxides of nitrogen (NO_x) emissions are primarily associated with gas and diesel equipment exhaust. With respect to the proposed project, restoration activities would result in the temporary generation of ozone precursors, PM₁₀, and PM_{2.5} emissions from site preparation (e.g., excavation, grading, and clearing), material transport, employee commute trips, and other miscellaneous activities.

Short-term increases in emissions of ozone precursors would occur during orchard removal and restoration activities projects, associated with ground disturbance and heavy equipment exhaust. TNC has committed to chip orchard trees on-site and haul the biomass to an off-site co-generation facility. Thus, no open burning of orchard trees or debris would occur as part of the project.

Because standard construction mitigation measures are not currently incorporated into the project description, taken with the nonattainment status of the County for PM₁₀, temporary construction emissions could conflict with applicable air quality planning efforts, contribute substantially to an existing or projected air quality violation, and/or result in a substantial contribution to a cumulative air quality impact. As a result, this impact is considered potentially significant.

Long-Term Operational Emissions

As discussed in Section 3.15, Transportation/Traffic, the long-term operation of the proposed habitat restoration project does not propose any vehicle-trip generating land uses, would not require any additional employees, and would result in minor increased operation or maintenance trips over the three year restoration period. Consequently, project implementation would result in a negligible increase in VMT and associated emissions. Furthermore, the project would not result in the operation of any major stationary emission sources. The operation of the project would result in a minor net increase of long-term regional ROG, NO_x, or PM₁₀. It is possible that the additional riparian habitat could cause an increase in visitors to SRNWR; however, the project involves no new recreational facilities.

Thus, operation of the proposed project would not conflict with or obstruct implementation of GCAPCD’s air quality planning efforts, or contribute to a violation of air quality standards. This impact would be less than significant for long-term operational emissions.

Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions generated during site preparation and restoration activities would predominantly be in the form of carbon dioxide (CO₂). Long-term operation of the project would result in a negligible amount of GHG emissions, for the reasons described above (e.g., the project would result in nominal mobile-source emissions and no stationary or area sources of emissions). In addition, the removal of the walnut orchard would result in loss of existing carbon sequestration potential, because of the process of CO₂ uptake by vegetation during photosynthesis. As stated previously, the orchard debris would be converted into biomass for use at a co-generation plant, which is a less-GHG-intensive method for generating electricity than coal or natural gas. Once established, the restoration project would eventually (i.e., over the life of the project) offset the indirect GHG emissions from orchard removal and

construction-generated GHG emissions that would occur during the site preparation phase. Thus, project would not result in a substantial contribution of GHG emissions to the cumulative impact of climate change. This impact would be less than significant for GHG emissions.

Mitigation Measure AQ-1: Implement Dust-Control Measures.

With the implementation of the following mitigation measures, which are consistent with the measures required in the NEPA EA (Appendix A) to address impacts to air quality, short-term construction-generated air quality impacts would be reduced to a less-than-significant level. This mitigation measure would also minimize cumulative impacts on air quality.

Reasonable precautions shall be taken to prevent fugitive dust from leaving the project site, including, but not limited to:

- ▶ land disturbing operations will be suspended when winds exceed 20 miles per hour (mph) to prevent fugitive dust and particulate matter from leaving the project site;
- ▶ dust control measures (e.g., water trucks) will be utilized as necessary to manage dust on the project site;
- ▶ all unpaved road surfaces shall be watered, as necessary, to minimize fugitive dust emissions;
- ▶ all unpaved surfaces, unless otherwise treated with suitable chemicals or oils, shall have posted speed limits of 15 mph and/or all project-related personnel shall be instructed to not exceed this speed;
- ▶ when dust or particulate-producing materials are transported off-site, all such material shall be covered, effectively wetted to limit visible dust emissions, or at least six inches of freeboard space from top of the container shall be maintained; and
- ▶ all operations shall minimize the accumulation of mud or dirt on adjacent public streets or expeditiously remove project-related dirt at least once every 24 hours when construction activities are occurring.

- d) Less-than-Significant Impact.** The nearest off-site sensitive receptors (farm residences) are located approximately 0.2 miles from the eastern and northeastern portions of the project site. There is existing riparian habitat buffering those residences from the proposed restoration area. The majority of sensitive receptors would be recreational users that are using the Sul Norte Unit of the SRNWR located to the north of the project site. The project itself would not involve the siting of sensitive receptors. There are no major off-site stationary sources of emissions in the project vicinity (ARB 2008b). Project implementation would not result in the operation of any new major stationary emission sources of toxic air contaminants (TACs) or generation of excessive concentrations of criteria air pollutants (i.e., those addressed in “a” above). Construction-related activities would result in project-generated emissions of TACs (e.g., diesel PM) from heavy-duty truck travel and heavy-duty construction equipment at the proposed restoration site. Diesel PM was identified as a TAC by ARB in 1998. However, sensitive receptors would not be exposed to substantial pollutant concentrations as a result of the proposed project because diesel PM is highly dispersive and would dissipate rapidly (Zhu and Hinds 2002), construction would be temporary (i.e., duration of three years), and sensitive receptors are located a sufficient distance from the project boundary. Therefore, this impact would be less than significant.

- e) **Less-than-Significant Impact.** The project would not result in any major sources of odor, and the project type is not one of the common types of facilities that are known to produce odors (e.g., landfill, wastewater treatment facility). In addition, diesel exhaust from the use of on-site construction equipment would be intermittent and temporary, and would dissipate rapidly from the source with an increase in distance. Thus, project implementation would not create objectionable odors affecting a substantial number of people. As a result, this impact would be less than significant.

3.4 BIOLOGICAL RESOURCES

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IV.	Biological Resources. Would the project:				
a)	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

HABITAT TYPES

The SRNWR currently consists of 10,818 acres of agricultural and riparian floodplain habitats. Agricultural areas include walnut orchards, pasture, and row crops accounting for 16% of SRNWR lands. Riparian habitat types (i.e., vegetation communities) include open river channel water, off-channel oxbow wetlands, gravel and sand bars, herbland cover, blackberry scrub, Great Valley riparian scrub, Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Valley oak, Valley freshwater marsh, perennial and annual grasslands, giant reed, disturbed, and restored riparian.

Currently, walnut orchards dominate the Codora Unit. The unit contains a 274.5 acre walnut orchard that is surrounded by 126 acres of existing remnant habitat. The project site's walnut orchard is a monoculture of English walnut (*Juglans regia*). Ongoing agricultural activities prevent herbaceous vegetation from establishing

beneath the walnut tree overstory. The remnant habitat is composed primarily of cottonwood riparian forest and valley oak forest. The location and extent of habitats present are depicted in Exhibit 2-3. The vegetation profile includes naturally regenerating arroyo willow, cottonwood, and box elder on 28 acres that were last row cropped in 1995. The site also contains annual rye grass, Johnsongrass, morning glory, chickweed, and other problematic weeds that can inhibit native plant growth if left unchecked.

WILDLIFE RESOURCES

Riparian and floodplain habitats at the SRNWR provide water, food, cover, and shelter to a variety of wildlife which breed and/or winter here. These include migratory gulls and terns, herons and egrets, ducks and geese, shorebirds, hawks, eagles, turkey vultures, and a variety of songbirds and other landbirds such as swallows, woodpeckers, California quail, and wild turkeys. The SRNWR also provides habitat for various bats, rabbits/hares, squirrels, raccoons, ringtail cats, skunks, river otters, black-tailed deer, coyotes, bobcats, mountain lions, lizards, skinks, western pond turtles, snakes, frogs, and various aquatic and terrestrial insects, including beetles, bees, flies, butterflies, moths, dragon and damselflies, and spiders.

The food, water, and shade that agricultural crops offer attract a limited number of wildlife species. Mourning dove, western bluebird, scrub-jay, red shafted-flicker, lazuli bunting, European starling, and house finch are known to nest in orchards. Black-tailed hare, California vole, and pocket gopher are also present in orchards. Deer and rabbits browse on trees; squirrels and various birds feed on nuts. Species that have been reported to feed on nut crops include northern flicker, scrub jay (*Aphelocoma coerulescens*), American crow (*Corvus brachyrhynchos*), plain titmouse (*Parus inornatus*), Brewer's blackbird (*Euphagus cyanocephalus*), house finch (*Carpodacus mexicanus*), and California ground squirrel (*Spermophilus beecheyi*) (Mayer and Laudenslayer 1988).

FISHERIES RESOURCES

The Sacramento River provides important habitat for a diverse assemblage of fishes, including both anadromous (i.e., species that spawn in freshwater after migrating as adults from marine habitat) and resident species. Native anadromous species that occur in the Sacramento River include four runs of Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), green and white sturgeon (*Acipenser medirostris* and *A. transmontanus*), and pacific lamprey (*Lampetra tridentata*). Native resident species include Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento squawfish (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus occidentalis*), hardhead (*Mylopharodon conocephalus*), and rainbow trout (*Oncorhynchus mykiss*). Introduced anadromous species include striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*). Introduced resident species include warm water game fish such as largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), white and black crappie (*Pomoxis annularis* and *nigromaculatus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ictalurus nebulosus*), bluegill (*Lepomis macrochirus*), and green sunfish (*Lepomis cyanellus*); cold water game fish such as brown trout (*Salmo trutta*); and nongame fish such as golden shiner (*Notemigonus crysoleucas*).

SENSITIVE BIOLOGICAL RESOURCES

Sensitive biological resources addressed in the following sections include those that are afforded special protection through the California Environmental Quality Act (CEQA), the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), the California Fish and Game Code, and the federal Clean Water Act (CWA).

SPECIAL-STATUS SPECIES

Special-status species include plants and animals that are legally protected or are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status species addressed in this section include:

- ▶ species listed or proposed for listing as threatened or endangered under ESA or CESA;
- ▶ species considered as candidates for listing as threatened or endangered under ESA or CESA;
- ▶ species identified by the California Department of Fish and Game (DFG) as California Species of Special Concern;
- ▶ animals fully protected in California under the California Fish and Game Code;
- ▶ plants listed as Endangered or Rare under the California Native Plant Protection Act;
- ▶ plants designated by the California Native Plant Society (CNPS) as List 1B (plants rare, threatened or endangered in California and elsewhere) or List 2 (plants rare, threatened or endangered in California but more common elsewhere); and
- ▶ CALFED Bay-Delta Program Multi-Species Conservation Strategy Goals.

An evaluation of special-status species with potential to occur on and adjacent to the project site was conducted, based on searches of the California Department of Fish and Game's California Natural Diversity Database (CNDDB) (2008) and the CNPS Electronic Inventory of Rare and Endangered Plants of California (CNPS 2008), and review of existing biological resource documents. CNDDB and CNPS Inventory searches were conducted for the following USGS 7.5-minute quadrangles: Princeton and Butte City (the quadrangles on which the project site occurs) and Nelson, West of Biggs, Pennington, Sanborn Slough, Moulton Weir, Maxwell, Logandale, Willows, Glenn, and Llano Seco (the other quadrangles immediately surrounding the project site).

SPECIAL-STATUS PLANT SPECIES

Twenty two special-status plant species were identified in the CNDDB and CNPS searches as occurring in the project vicinity. Suitable habitat is limited because the project site is characterized by walnut orchards that have been subject to agricultural activities that preclude establishment of other plant species beneath the walnut trees. However, special-status plant species could be present in the riparian habitats adjacent to the existing orchards. Table 3-1 provides information on special-status plants that are known from the vicinity of the project site and that have potential to occur in the nearby remnant riparian habitats.

Nineteen of the special-status plant species identified in the database searches as occurring in the nine quadrangles surrounding the project site were eliminated from the potential species table and from further review in this document because the project site does not contain suitable habitat (i.e., vernal pools, valley grassland, shadscale scrub, alkali sink) or they do not typically occur in the project site elevation range. These species are Ferris's milkvetch (*Astragalus tener* var. *ferrisiae*), heartscale (*Atriplex cordulata*), brittlescale (*A. depressa*), San Joaquin saltbush (*A. joaquiniana*), lesser saltbush (*A. miniscula*), Sacramento saltbush (*A. persistens*), deltoid bract saltbush (*A. subtilis*), round-leaved filaree (*California macrophylla*), pink creamsacs (*Castilleja rubicundula* ssp. *rubicundula*), pappose tarplant (*Centromadia parryi* ssp. *parryi*), Hoover's spurge (*Chamaesyce hooveri*), palmate bracted bird's beak (*Cordylanthus palmatus*), recurved larkspur (*Delphinium recurvatum*), Heckard's peppergrass (*Lepidium latipes* var. *heckardii*), Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*), Colusa grass (*Neostapfia colusana*), hairy Orcutt grass (*Orcuttia pilosa*), caper fruited tropidocarpum (*Tropidocarpum capparideum*), Greene's tuctoria (*Tuctoria greenei*).

As listed in Table 3-1, three special-status plant species—fox sedge (*Carex vulpinoidea*), rose-mallow (*Hibiscus lasiocarpus*), and Columbian watermeal (*Wolffia brasiliensis*)—have moderate to low potential to occur in freshwater marsh or riparian habitat at the project site.

Table 3-1 Special-status Plants with Potential to Occur Adjacent to the Project site						
Species	Status ¹				Habitat and Blooming Period	Potential for Occurrence ²
	Federal	State	CNPS	MSCS Goals ³		
Plants						
Fox sedge <i>Carex vulpinoidea</i>	—	—	2	—	Freshwater marshes and swamps, riparian woodland Blooms May–June	Could occur; suitable freshwater marsh and riparian habitat is present on the project site. Known from the Llano Seco Unit.
Rose-mallow <i>Hibiscus lasiocarpus</i>	—	—	2	m	Freshwater marshes and swamps, generally found on wetted river banks and low peat islands in sloughs Blooms June–September	Could occur; suitable habitat is present on the project site. Known from tributary sloughs in the area.
Columbian watermeal <i>Wolffia brasiliensis</i>	—	—	2	—	Assorted shallow freshwater marshes and swamps Blooms in April–December	Could occur; suitable freshwater marsh is present in the vicinity of the project site.
¹ Legal Status Definitions CNPS Categories: 1B Plant species considered rare or endangered in California and elsewhere 2 Plant species considered rare or endangered in California but more common elsewhere ² Potential for Occurrence Definitions <i>Unlikely to occur.</i> Suitable habitat is available on or adjacent to the project site; however, the amount of habitat is limited. <i>Could occur.</i> Suitable habitat is available on or adjacent to the project site; however, there are little to no other indicators that the species is present. ³ Multi-Species Conservation Strategy Goals R Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature. r Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area. m Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species (CALFED Bay–Delta Program 2000).						

SPECIAL-STATUS WILDLIFE

The SRNWR provides breeding, rearing, migratory staging, and wintering habitat for federal and state threatened and endangered species and other special-status or sensitive species. These species include federally listed endangered Chinook salmon (winter-run ESU) and federally listed threatened Chinook salmon (spring-run ESU), Central Valley steelhead, North American Green Sturgeon Southern DSP, VELB; and federal candidate species western yellow-billed cuckoo and Chinook salmon (fall- and late-fall run ESU).

Table 3-2 provides information on special-status wildlife species with potential to occur on or adjacent to the project site, including the species' regulatory status, habitat requirements, CALFED MSCS conservation goals, and an assessment of their potential for occurrence. Eleven special-status wildlife species have potential to nest in suitable habitats on or adjacent to the project site. An additional nine special-status species have potential to

forage adjacent to the project site. Four of these species may also forage occasionally in the project site orchards, but are more strongly associated with riparian forest habitats.

Table 3-2 Special-status Wildlife with Potential to Occur In or Adjacent to the Project Area					
Species	Status ¹			Habitat	Potential for Occurrence ²
	Federal	State	MSCS Goals ³		
Invertebrates					
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	T	—	R	Elderberry shrubs, typically in riparian habitats	Could occur; elderberry shrubs present in riparian habitats in the vicinity of the project site.
Reptiles					
Giant garter snake <i>Thamnophis gigas</i>	T	T	r	Slow-moving streams, sloughs, ponds, marshes, inundated floodplains, rice fields, and irrigation and drainage ditches	Unlikely to occur; sloughs on and adjacent to the project site offer potentially suitable habitat; however, giant garter snakes have not been recorded between the levees of the Sacramento River floodplain. Orchards on the project site are unsuitable due to ongoing agricultural cultivation.
Northwestern pond turtle <i>Actinemys marmorata marmorata</i>	—	SSC	m	Ponds, marshes, rivers, streams, sloughs	Could occur; suitable aquatic habitat is present in the project vicinity.
Birds					
Northern harrier <i>Circus cyaneus</i>	—	SSC	m	Forage and nest in grasslands, agricultural fields, and marshes	Likely to occur; suitable nesting and foraging habitat present on the project site and species is known throughout the area.
Cooper’s hawk <i>Accipiter cooperii</i>	—	—	m	Forage and nest in open woodlands and woodland margins	Could occur; suitable foraging and nesting habitat in riparian forest in the vicinity of the project site.
Swainson’s hawk <i>Buteo swainsoni</i>	—	T	R	Forage in grasslands and agricultural fields; nest in open woodland or scattered trees	Likely to occur; suitable foraging habitat in row crop fields in the vicinity of the project site; suitable nesting habitat in riparian forests in the vicinity of the project site
California black rail <i>Laterallus jamaicensis coturniculus</i>	—	T	—	Freshwater marsh	Could occur; suitable aquatic habitat is present in the project vicinity.
Greater sandhill crane <i>Grus canadensis tabida</i>	—	T	—	Open short grasslands and agricultural habitats, especially grain crops.	Unlikely to occur; no suitable habitat on the project site.
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	C	E	R	Riparian forest, typically with mature cottonwoods and willows	Could occur; suitable foraging and nesting habitat in riparian forests in the vicinity of the project site.

Table 3-2 Special-status Wildlife with Potential to Occur In or Adjacent to the Project Area					
Species	Status ¹			Habitat	Potential for Occurrence ²
	Federal	State	MSCS Goals ³		
Bank swallow <i>Riparia riparia</i>	—	T	R	Forage in various habitats; nests in banks or bluffs, typically adjacent to water	Could occur; suitable nesting and foraging habitat present on the project site.
Tricolored blackbird <i>Agelaius tricolor</i>	—	SSC	—	Nests colonially in cattails, tules, willows, blackberries, nettles, mustards, thistles, and other dense vegetation; Forages in grasslands and agricultural fields.	Could occur; suitable nesting habitat in freshwater marsh and blackberry scrub in the vicinity of the project site; foraging habitat in row crops adjacent to the project site.
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	—	E	—	Riparian woodland and scrub; typically nests in willow and alder patches	Could occur; suitable foraging and nesting habitat in riparian forests adjacent to the project site.
Yellow warbler <i>Dendroica petechia</i>	—	SSC	—	Riparian woodland and scrub	Could occur; suitable foraging and nesting habitat in riparian forests adjacent to the project site.
Yellow-breasted chat <i>Icteria virens</i>	—	SSC	m	Riparian woodland and scrub, with dense shrub cover	Could occur; suitable foraging and nesting habitat in riparian forests adjacent to the project site.
Mammals					
American badger <i>Bassariscus astutus</i>	—	SSC	—	Grassland, shrub, and woodland habitats with friable soils.	Could occur; suitable habitat present on the project site.
¹ Legal Status Definitions <div> <div> <u>Federal</u> E T C Listing </div> <div> Endangered Threatened Candidate for </div> <div> <u>State</u> E T FP SSC </div> <div> Endangered Threatened Fully Protected Species of Special Concern </div> </div>					
² Potential for Occurrence Definitions <i>Unlikely to occur.</i> Habitat on or adjacent to the project site is generally suitable; however, the species is not known to occur in the vicinity and is not expected to occur because of one or more important habitat factors. <i>Could occur.</i> Suitable habitat is available on or adjacent to the project site; however, the species has not been documented on or adjacent to the project site. <i>Known to occur.</i> The species was reported in a TNC Site Assessment as having been observed within 5 miles of the project site and within the Sacramento River levees (Hubbell et al. 2003a and 2003b).					
³ Multi-Species Conservation Strategy Goals R Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature. r Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area. m Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species (CALFED Bay-Delta Program 2000).					

Special-Status Invertebrates

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), or VELB, is listed as threatened under the Federal Endangered Species Act (ESA). VELB spends its entire life cycle on blue elderberry (*Sambucus mexicana*), which provides reproductive habitat and food for the species. As such, elderberry shrubs are legally protected because they are the host plant for VELB. Elderberry shrubs occur in mixed riparian forests and savannas. Elderberry shrubs are present in riparian areas near the restoration sites but are not common in agricultural or orchard habitats where routine agricultural practices prevent the germination or growth of seedlings.

Special-Status Reptiles

Giant garter snakes inhabit a variety of aquatic habitats, such as marshes, sloughs, ponds, flooded rice fields, irrigation canals and drainage ditches, and inundated floodplains. They are typically absent from large or swift-moving rivers, heavily wooded riparian habitats, and from wetlands with sand, gravel, or rock substrates (USFWS 1999). These snakes also require adjacent upland habitat for basking and burrows that provide sufficient cover and are at high enough elevations to function as refuges from flood waters during the snakes' inactive season (October–May). The project site is within the geographic range of this species and there are documented occurrences in the vicinity of the project site. However, giant garter snakes are unlikely to occur in any habitat between the flood control levees of the Sacramento River, because of the high flows in winter (Hansen, pers. comm., 2006). Because they depend on year-round habitat suitability, these snakes generally do not occupy otherwise suitable habitat that is located within flood control levees, even during their summer active season when flows are lower. This trend has been observed throughout the Central Valley (Hansen, pers. comm., 2006).

Northwestern pond turtles generally occur in streams, ponds, freshwater marshes, and lakes. They require still or slow moving water with emergent woody debris, rocks, or other similar features for basking sites. Nests are typically located on unshaded upland slopes in dry substrates with clay or silt soils. Northwestern pond turtles could occur in the slow-moving aquatic habitat on and adjacent to the project site. They are unlikely to occur in the Sacramento River, which is generally fast-moving and unlikely to provide suitable habitat.

Special-Status Birds

Northern harriers nest and forage in grasslands and row crop fields and in marsh habitats. This species has potential to occur in row crop fields adjacent to the project site. Cooper's nest and forage primarily in riparian forest habitats. Cooper's hawks have potential to nest and forage in such habitats adjacent to the project site.

Yellow-billed cuckoos require large blocks (greater than 40 hectares) of riparian forest vegetation for nesting (Laymon et al. 1997). Historically, this species was common and widespread in river bottom riparian habitat throughout California, but numbers have declined dramatically as a result of habitat loss. The existing riparian vegetation and proposed areas of restored riparian vegetation do and will support several species of migratory birds. Some of these species, including yellow-billed cuckoo, require mature riparian vegetation composed of willow and cottonwood. This habitat type will support other special-status species, such as willow flycatcher, during migration and provides nesting habitat for many other bird species. However, willow flycatchers have been eliminated from much of their former range in California, and breeding populations in northern California are now primarily restricted to montane meadows in the Sierra Nevada. This species nests in shrubby riparian vegetation, typically in areas with at least some surface water (Bombay et al. 2000). Willow flycatchers are likely to occur in riparian habitat in the vicinity of the project site during migration, but they are not expected to nest there.

In the Central Valley, Swainson's hawk nest sites are strongly associated with riparian forest and savanna vegetation near open agriculture such as alfalfa, cereal grains, and irrigated pasture; the primary habitat requisite provided by riparian systems is nesting substrate, typically large trees (Riparian Habitat Joint Venture (RHJV)

2004). In Central California, about 85% of Swainson's hawk nests are within riparian forest or remnant riparian trees, with nearby treeless agricultural lands used for foraging (RHJV 2004). Swainson's hawks have been observed perched in valley oak trees and flying in broad circles along the Sacramento River from Red Bluff to Colusa. While they are not known to nest on the project site, they are known to nest in the vicinity of other SRNWR units, such as the neighboring Sul Norte Unit.

Annual erosion of mid and high floodplain elevation banks of Columbia silty-loam and Columbia sandy-loam is necessary for bank swallow colony establishment. The largest populations occur along the middle Sacramento River, from Red Bluff to Colusa, and survey results have shown the importance of the SRNWR to the bank swallow, a California threatened species. The majority of the eastern boundary of the Codora Unit consists of an eroding steep cut bank, which could potentially be colonized by bank swallows in the future. A bank swallow colony was located at the north end of the Codora Unit in June 2008 on adjacent State Parks land.

Tricolored blackbirds nest in dense colonies that range from less than 25 individuals to more than 80,000 and often change colony locations from year to year. Tricolored blackbirds may nest in a variety of habitats, including riparian vegetation. Tricolored blackbirds could nest in the blackberry scrub and freshwater marsh habitat, as well as willow-dominated riparian areas, in the vicinity of the project site. However, these areas provide lower-quality nesting habitat for this species, as they nest less frequently in willow-dominated vegetation than in emergent marsh vegetation or thickets of thorned plants such as blackberries. Tricolored blackbirds forage in grasslands, pastures, and agricultural fields, and could forage adjacent to the project site.

Yellow warblers typically nest in willow thickets, and yellow-breasted chats typically nest in riparian habitats with a dense shrub layer. Yellow warblers are relatively uncommon breeders in the Central Valley, but a breeding pair was recorded nesting in riparian habitat adjacent to the SRNWR Capay Unit (TNC 1999). Yellow-breasted chats are also known to breed in riparian habitat adjacent to the Capay Unit and are could nest in such habitats in the vicinity of the project site.

Special-Status Mammals

The American badger inhabits a variety of grassland, shrub-steppe, and wooded habitats with friable soils. One badger occurrence has been documented by CNDDDB within 5 miles of the project site. Although no badger burrows have been observed, potentially suitable habitat for badger is present in the riparian habitat adjacent to the project site.

Special-Status Fish

Table 3-3 provides information on special-status fish species known to occur in the Sacramento River, including the species' regulatory status and habitat description. A total of seven special-status fish species are known to occur adjacent to the project area during at least a portion of their life cycles. In some cases, it is an evolutionarily significant unit (ESU) of a fish species, rather than the entire population, that is listed as special-status. (An ESU is a distinctive group of Pacific salmon. ESU is further described below.)

Table 3-3 Special-status Fish with Potential to Occur Adjacent to the Project Area				
Species	Status ¹			Habitat
	Federal	State	MSCS Goals ²	
Chinook salmon – Sacramento River winter-run <i>Oncorhynchus tshawytscha</i>	E	E	R	Rivers and streams, including the Sacramento River.
Chinook salmon - Central Valley spring-run <i>Oncorhynchus tshawytscha</i>	T	T	R	Rivers and streams, including the Sacramento River.

Table 3-3 Special-status Fish with Potential to Occur Adjacent to the Project Area				
Species	Status ¹			Habitat
	Federal	State	MSCS Goals ²	
Chinook salmon - Central Valley fall-/late fall-run <i>Oncorhynchus tshawytscha</i>	—	SSC	R	Rivers and streams, including the Sacramento River.
Central Valley steelhead <i>Oncorhynchus mykiss</i>	T	—	R	Rivers and streams, including the Sacramento River.
Green sturgeon <i>Acipenser medirostris</i>	T	—	R	Bay-Delta and associated large rivers, including the Sacramento River.
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	—	SSC	R	Bay-Delta and associated rivers and streams, including the Sacramento River.
Hardhead <i>Mylopharodon conocephalus</i>	—	SSC	m	Rivers and streams, including the Sacramento River.
¹ Legal Status Definitions				
<u>Federal</u>		<u>State</u>		
E	Endangered	E	Endangered	
T	Threatened	T	Threatened	
C	Candidate for listing	SSC	Species of Special Concern	
² Multi-Species Conservation Strategy Goals				
R	Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.			
r	Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.			
m	Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species (CALFED Bay–Delta Program 2000).			

Special-status fish species occurring in the vicinity of the project site include Central Valley fall-/late-fall-run Chinook salmon, Sacramento River winter run Chinook salmon, Central Valley spring run Chinook salmon, steelhead, green sturgeon, Sacramento splittail, and hardhead. Most of these species are anadromous and spend various life stages in the project area. These species may only be present near the project site during certain times of year, described in the text following Table 3-3. The only exceptions are splittail and hardhead, which are resident species.

Chinook Salmon

Four runs of Chinook salmon occur in the Sacramento River, including fall-, late fall-, winter-, and spring-run. The distribution and abundance of each run is limited by the availability of suitable habitat during their respective spawning seasons. Chinook salmon use this portion of the Sacramento River as a migratory pathway for adults and as rearing habitat for emigrating juveniles. Fall-run Chinook salmon is the most abundant ESU, documented to comprise about 80% of the Sacramento Basin stock in the early 1980s (Kjelson et al. 1982). Under ESA, an ESU is considered a population (or group of populations) that is reproductively isolated from other populations of the same species and that contributes substantially to the ecological/genetic diversity of the species (Waples 1991). Different runs of the same salmon species are often considered separate ESUs because the populations are reproductively isolated because of different spawning times. The portion of the Sacramento River adjacent to the project site is designated as critical habitat for winter-run and spring-run Chinook salmon. Critical habitat includes the river water, river bottom, and adjacent riparian zone (i.e., those adjacent terrestrial areas that directly affect a freshwater aquatic ecosystem).

Winter-run Chinook salmon typically migrate by the project area from December through July as adults, and from November through May as emigrating juveniles. Adult spring-run Chinook salmon generally migrate by the

project area from March to September, while juveniles and yearlings emigrate downstream from March to June and November to April, respectively. Adult fall-run Chinook salmon enter the Sacramento River system from July through December and spawn from October through December. Late fall-run Chinook salmon enter the river from October to April and spawn from January to April (Vogel and Marine 1992).

Since 1981, USFWS personnel have captured juvenile Chinook salmon using beach seines at 13 sampling sites between RM 298 (Redding) and RM 164 (Princeton). USFWS data provides information on presence/absence, timing of migration, and size of juvenile Chinook salmon runs. The four different runs of Chinook salmon exhibit different rearing strategies that are partially explained by the availability of food, river flows, and water temperatures in the upper and lower river and Bay-Delta area. Generally, fall and spring-run Chinook salmon move out of the upper river 1–2 months after emergence, and are hypothesized to rear in the lower river or in the Bay-Delta. A portion of the winter-run Chinook salmon migrate out of the upper river soon after emergence; however, the majority appear to rear in the upper river and tributaries (Maslin et al. 1997 and 1998). Late-fall-run Chinook salmon tend to reside 4–6 months in the upper river before moving out of the system (USFWS 1992).

Steelhead

Steelhead use the portion of the Sacramento River adjacent to the project site (along with other areas) as a migratory pathway for adults and as rearing habitat for emigrating juveniles. Historical records indicate that adult steelhead enter the mainstem Sacramento River in July, reach peak abundance in the fall, and continue migrating through February or March (McEwan and Jackson 1996). Juveniles emigrate downstream to the ocean beginning in November and continuing through May (Schaffter 1980), although most Sacramento River steelhead emigrate in spring and early summer. Sacramento River steelhead generally migrate as 1-year-olds (Barnhart 1986, Reynolds et al. 1993). The portion of the Sacramento River adjacent to the project site is designated critical habitat for Central Valley steelhead.

Green Sturgeon

Green sturgeon has recently has been listed as threatened by NMFS (71 FR 17757). Green sturgeon occur in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith rivers (Moyle et al. 1992). Green sturgeon adults and juveniles occur throughout the upper Sacramento River, based upon observations incidental to winter-run Chinook monitoring at the Red Bluff Diversion Dam in Tehama County (Brown 2006). Green sturgeon spawn predominantly in the upper Sacramento River. They are thought to spawn every 3–5 years. Their spawning period is March to July, with a peak in mid-April to mid-June (Moyle et al. 1992). Juveniles inhabit the estuary until they are approximately 4–6 years old, when they migrate to the ocean (Kohlhorst et al. 1991).

Sacramento Splittail

Sacramento splittail were historically widely distributed throughout much of the Central Valley, but dams and diversions have prevented them from reaching many upstream reaches, and the current population is concentrated in the Bay-Delta region. Recent data indicate that splittail occur in the Sacramento River as far upstream as the Red Bluff Diversion Dam (RM 240) (Sommer et al. 1997, Maslin et al. 1997), and that some adults spend the summer in the mainstem Sacramento River rather than return to the estuary (Baxter 1999). The distribution and extent of spawning and rearing along the mainstem Sacramento River is unknown. Splittail spawn over flooded terrestrial or aquatic vegetation (Moyle 2002, Wang 1986) in early March and May in the lower reaches of the Sacramento River (Moyle et al. 1989). Spawning has been observed as early as January and continues through July (Wang 1986). Larval splittail are commonly found in the shallow, vegetated areas where spawning occurs. Larvae eventually move into deeper open water habitats as they grow and become juveniles. Riparian vegetation in the vicinity of the project site that is prone to sustained flooding provides potential splittail spawning and rearing habitat.

Hardhead

Hardhead are widely distributed throughout the low- to mid-elevation streams in the main Sacramento–San Joaquin drainage as well as in the Russian River drainage. Hardhead prefer undisturbed portions of larger streams at low to middle elevations. They are able to withstand summer water temperatures above 68°F; however hardhead will select lower temperatures when they are available. They are fairly intolerant of low-oxygenated waters, particularly at higher water temperatures. Pools with sand-gravel substrates and slow water velocities are the preferred habitat; adult fish inhabit the lower half of the water column, while the juvenile fish remain in the shallow water closer to the stream edges. Hardhead typically feed on small invertebrates and aquatic plants at the bottom of quiet water (Moyle 2002).

SENSITIVE HABITATS

Sensitive habitats include those identified as sensitive natural communities “rare and worthy of consideration” in the List of California Terrestrial Natural Communities Recognized by the CNDDDB, as well as those protected under Section 404 of the Clean Water Act (CWA), Section 1602 of the California Fish and Game Code, and the State’s Porter-Cologne Water Quality Control Act. Sensitive habitats are of special concern because they are of high value to plants, wildlife, and fish species and have high potential to support special-status species. Sensitive habitats also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality.

Sensitive habitats in the vicinity of the project site include Great Valley riparian scrub, Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Valley freshwater marsh, and oxbow wetlands. These habitats are protected under the Fish and Game Code and/or federal CWA.

DISCUSSION

- a) **Special-status Plants - No Impact/Beneficial Impact.** Three special-status plant species have potential to occur in riparian and freshwater marsh habitats in the vicinity of the project site. However, none of these habitats currently existing on the project site, which is a monoculture of English walnut. Therefore, these sensitive habitats and plant species would not be adversely affected by site preparation and implementation of the proposed restoration project. Rather, the project would result in a long-term increase in the overall amount of sensitive habitat that could support special-status plant species within the project area. Therefore, impacts on special-status plants would be beneficial.

Special-status Wildlife - No Impact/Beneficial Impact. Implementation of the proposed project would result in an overall benefit to wildlife. Approximately 274.5 acres would be restored from cultivated orchard to native riparian habitat, which supports a greater diversity and abundance of wildlife, including many special-status species. The benefits of riparian restoration have been confirmed by recent research, which has shown substantial population increases for a variety of bird species at riparian restoration sites, with eight species increasing by more than 10% in ten years, and with significantly higher rates of population growth at restored sites than in the Sacramento Valley as a whole or the state of California (Gardali et. al., 2006). In addition, the USFWS proposal to delist valley elderberry longhorn beetles from their current threatened status was due in part to the success of past riparian restoration projects (USFWS 2006), and the first Central Valley nest of endangered least Bell’s vireos in over 60 years was recorded in a San Joaquin River restoration site in 2005 (USFWS 2005).

Valley Elderberry Longhorn Beetle – Less-than-Significant Impact. No elderberry shrubs would be directly affected by site preparation or habitat restoration activities, because these activities would be restricted to the project site, which is a monoculture of English walnut that has had ongoing agricultural activities that prevented formation of a vegetation understory beneath the walnut trees. Therefore, the project site currently does not support any elderberry shrubs.

The levee district has expressed concerns that planting elderberry shrubs near levees could lead to the spread of VELB, with resulting special-status species issues. The SRNWR has implemented a self-imposed, 100-foot valley elderberry shrub-free zone intended to buffer the boundaries between private orchards, levees, roadways and that of SRNWR restoration sites so that agricultural pesticide drift from neighboring private orchards and facility and levee maintenance operations will not affect VELB habitat in restoration sites or adjacent landowner operations. No elderberry shrubs would be planted in this corridor, thereby reducing the likelihood that VELB would spread onto levees as a result of the restoration program. The proposed restoration areas in the Codora Unit are also bordered on all sides by existing habitat already managed by the SRNWR where the levee and a 20 to 30 foot buffer from the toe to habitat is managed as vegetation-free.

Because the project would avoid adverse effects to elderberry shrubs and valley elderberry longhorn beetles, the proposed project would result in a less-than-significant impact on valley elderberry longhorn beetles.

Nesting Raptors, Special-status Birds, and Migratory Birds – Less than Significant with Mitigation Incorporated. Implementation of the proposed project could result in construction-related loss and/or disturbance of birds nesting or roosting on or near the project site. Several special-status birds have the potential to nest on or adjacent to the project site (Table 3.4-2). Many common bird species may also nest in or near the project site, and are protected under MBTA and the California Fish and Game Code, with raptors receiving additional protection. Restoration activities could result in direct loss of orchard nests and bat roosting sites when orchard vegetation is removed. Birds nesting in habitat adjacent to the project site could also be disturbed by restoration activities, potentially resulting in nest abandonment and mortality of eggs or chicks. The following mitigation measures shall be implemented. These measures are consistent with those required in the NEPA EA (Appendix A) to address impacts to special status species.

Mitigation Measure BIO-1: Avoidance of Disturbance to Nesting Raptors and Special-status Birds.

Mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

To avoid nest disturbance and a potential reduction in fledging success resulting from construction activities during the breeding season (February 1 to August 31), focused surveys for raptors and special-status birds shall be conducted by a qualified biologist no more than 14 days prior to the beginning of construction. Surveys for Swainson's hawk nests shall include all areas of suitable nesting habitat within 0.25-mile of the project site. To the extent feasible, guidelines provided in the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in the Central Valley (Swainson's Hawk Technical Advisory Committee 2000) shall be followed. Surveys for other raptors and special-status birds would include suitable nesting habitat within 500 feet of the project site.

If no active nests are found, no further measures shall be needed. If active nests are found, impacts shall be avoided by the establishment of appropriate buffers and/or nest monitoring by a qualified biologist. The size of the buffer shall be determined by a qualified biologist and may vary, depending on the species biology, location, nest stage, and specific construction activities to be performed while the nest is active. No construction activities shall occur within a buffer zone until a qualified biologist confirms that the nest is no longer active.

Because this mitigation measure would avoid adverse effects to nesting raptors and special-status birds, the proposed project would result in a less-than-significant impact on nesting raptors and special-status birds.

Mitigation Measure BIO-2: Avoidance of Disturbance to Nesting Migratory Birds.

To avoid nest disturbance and a potential reduction in fledging success during any construction activities during the spring and summer breeding season, the project site's walnuts shall be harvested for the last time the previous autumn, and standard orchard maintenance practices (e.g., mowing and herbicide applications) would continue until construction begins to discourage bird nesting in the orchard before felling of the trees. As discussed above for raptors and special-status birds, mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

Because orchards would be restored to native habitats anticipated to support a higher diversity and abundance of wildlife species without significantly reducing populations of the species currently on site, the proposed restoration of native riparian habitat would have a long-term beneficial effect on wildlife. Potential impacts to existing wildlife that may occur during construction, maintenance, and visitor use of the proposed riparian habitat and recreational facilities would be expected to be minor. Because the benefits to wildlife of the proposed habitat restoration are expected to be more substantial than any potential construction, maintenance, or visitor use impacts that may occur, the overall effect of the proposed project is considered beneficial to wildlife species, including nesting raptors and migratory birds, and there would not be any substantial adverse effect to special-status species.

American Badger– Less-than-Significant Impact. Although badgers could forage and nest on the project site, they are unlikely to den in the orchards because of high levels of disturbance from agricultural activities. Restoration activities are not expected to adversely affect American badger; therefore, this impact would be less than significant.

Special-status Fish - No Impact/Beneficial Impact. Implementation of the proposed project would result in an overall net benefit to fisheries and aquatic resources of the Sacramento River. Implementation of the proposed project would not directly alter any instream fish habitat as all project activities and construction would take place on the floodplain. Implementation of the habitat restoration project would utilize standard agricultural practices already in use throughout the project area, including orchard removal, mowing, tilling, seeding, and planting. Irrigation system modification and expansion would include standard trench and backfill techniques. Minor and temporary increases in sediment load to the river could also occur during flood events. Increased sediment input could increase turbidity and reduce feeding efficiency of juvenile and adult fish. However, native vegetation would be planted concurrently or soon after removal of existing vegetation to minimize the potential for severe erosion to occur on disturbed, unprotected land. Because the Sacramento River is typically a turbid system during flood events, additional sediment input resulting from the proposed restoration project activity would be comparatively minimal, and is not anticipated to have any noticeable effect relative to the overall condition of the river. Gravel recruitment rates would not be significantly affected. In addition, restoration of agricultural lands to natural riparian areas would result in long-term beneficial effects to fish in the Sacramento River by increasing the complexity of the floodplain aquatic environment and providing cover, food, and other habitat components.

Because the benefits to fisheries of the proposed habitat restoration are expected to be more substantial than any potential construction, maintenance, or visitor use impacts that may occur, the overall effect of the proposed project is considered beneficial to fish habitat and special-status fish species.

USFWS Section 7 Consultation. The USFWS (2008) and NOAA-Fisheries (2008) are awaiting concurrence that the Codora Unit restoration is consistent with the following previous consultations:

- ▶ The Section 7 consultation with USFWS (2004) and NOAA-Fisheries (2004) concluded that the CCP (USFWS 2005) is not likely to adversely affect any of the special status species occurring on the SRNWR. The proposed project is consistent with the management described in the CCP and would not adversely affect any of the special status species.
- ▶ All activities are consistent with the programmatic Section 7 Consultation on Management, Operations, and Maintenance of the Sacramento National Wildlife Refuge Complex (USFWS 1999).

- b) No Impact/Beneficial Impact.** Restoration of riparian habitat at the project site would occur on approximately 274.5 acres of walnut orchards that have been in continual cultivation for over 14 years. These lands would be taken out of walnut production and restored to native habitat, including a combination of mixed riparian forest, cottonwood riparian forest, valley oak savanna, and valley needlegrass grassland. This restoration could temporarily reduce the local populations of common plant species (ruderal species along the edges of the orchards), but these species are locally and regionally abundant and are not considered sensitive. Sensitive habitats, including Great Valley riparian scrub, Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, and freshwater marsh, are present in the vicinity of the project site, but none of these habitats are present on the project site and would therefore not be adversely affected by implementation of the proposed restoration project. The project would result in a long-term increase in the overall amount of sensitive habitat within the project area. Therefore, impacts on sensitive natural communities, including riparian habitats, would be beneficial.
- c) No Impact.** The Sacramento River, a Traditional Navigable Water (TNC) qualifying for protection as waters of the United States under Section 404 of the CWA, is located immediately adjacent to the project site. In addition, the riparian habitats present in the vicinity of the project site may qualify as federally protected wetlands. Any fill of waters of the United States is subject to USACE jurisdiction under Section 404 of the Clean Water Act. However, the proposed project site is a walnut orchard without jurisdictional wetlands or waters. Implementation of the proposed restoration project would not result in the fill of any portion of the Sacramento River or other potential waters of the United States, including wetlands. Implementation of the habitat restoration project would utilize standard agricultural practices already in use throughout the project site, including orchard removal, mowing, tilling, seeding, and planting. Therefore, no impact on waters of the United States would result from project implementation.
- d) No Impact/Beneficial Impact.** There are no established wildlife nursery sites on the project site. The project would restore native riparian habitats on land currently cultivated as walnut orchard that provides little habitat value for cover or nesting. The project would result in a long-term increase in the overall amount of wildlife habitat within the project area, providing greater wildlife movement opportunities and greater connectivity with adjacent riparian habitats. Therefore, the project is expected to have a long-term beneficial impact on wildlife movement.
- e) No Impact.** The restoration project would not conflict with any local policies or ordinances regarding biological resources. No native trees would be removed during restoration activities and there are no ordinances protecting orchard trees. Therefore the project would result in no impact on protected trees or other biological resources protected under local policies or ordinances.
- f) No Impact.** There are no adopted Habitat Conservation Plans or Natural Community Conservation Plans existing for the project area. Therefore, the project would have not impact in relation to such plans.

3.5 CULTURAL RESOURCES

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V.	Cultural Resources. Would the project:				
a)	Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c)	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

DISCUSSION

The California State University Chico Research Foundation Archaeological Research Program conducted an archeological study of the middle Sacramento River floodplain in 2002, leading to the comprehensive Cultural Resource Overview and Management Plan – Sacramento River Conservation Area (White et al. 2003). This overview, assessment, and management plan provides a summary of the status of known cultural resources, a sensitivity study for resources yet to be identified, and general plans for future scientific investigations. It also provides public interpretation of archaeological and paleo-environmental findings, and administration and coordination for future actions which may affect cultural resources. Although the Codora Unit was not specifically included in this study, geomorphological mapping did indicate that the Unit is located on a younger landform, the upper portions of which were deposited no earlier than approximately 1000 years before the present day. To a certain extent, this precludes the Codora Unit from exhibiting significant early archaeological deposits. In addition, White et al. (2003) noted that in these comparatively recent landforms within the Sacramento River Conservation Area isolated prehistoric (and historic-era) artifacts have been noted but no archaeological sites have been documented.

In addition to the White et al. report serving as a baseline for a cultural resources assessment of the Codora Unit, EDAW conducted a reconnaissance-level survey of the Unit in November 2008 to determine if any previously undocumented cultural resources might be present or if potentially sensitive landforms occurred within or in the immediate vicinity. This survey did not result in the recording of any prehistoric or historic-era sites, features, or artifacts and no particularly sensitive landforms were noted.

a,b) Less than Significant with Mitigation Incorporated. Project-related orchard removal and site preparation activities could disturb previously unknown, buried, and significant (per CEQA) cultural resources that may be present on the project site. The area surrounding the Sacramento River was of considerable importance to Native American peoples as evidenced by the large number of prehistoric habitation sites, often containing human remains, that have been found in the general region. Although previous archaeological and geomorphological studies, and the EDAW survey indicate that no potentially significant (per CEQA) cultural resources are present within the Codora Unit, presently undocumented subsurface archaeological materials may be present. While it is unlikely that such resources exist, damage to or destruction of them could result in a potentially significant impact. However, implementation of

Mitigation Measure CR-1, outlined below, would reduce the project's potential impacts to less-than-significant levels.

Mitigation Measure CR-1: If unrecorded cultural resources are encountered during project-related ground-disturbing activities, a qualified cultural resources specialist shall be contacted to assess the potential significance of the find.

If during project-related ground-disturbing activities unusual amounts of shell, animal bone, rock concentrations, dark midden soil, bottle glass, ceramics, structure/building remains, etc. are uncovered or otherwise encountered, ground disturbances in the area of the find will be halted within a 100-foot radius and a qualified cultural resources specialist will be contacted. The archaeologist shall determine whether the resource is potentially significant per the California Register of Historic Resources (CRHR) and develop appropriate mitigation. Appropriate mitigation may include no action, avoidance of the resource, and potential data recovery.

Implementation of Mitigation Measure CR-1 would reduce potentially significant impacts resulting from inadvertent damage or destruction of unknown cultural resources during ground disturbing activities to a less-than-significant level.

- c) **No Impacts.** To be considered a fossil, a paleontological specimen must be more than 10,000 years old. Generally, rock formations within 8 to 10 feet of the soil surface are composed of deposits that are less than 10,000 years old. Because project activities would take place only within the top 8 to 10 feet of the soil surface, encountering paleontological resources would be unlikely. Therefore, there would be no impacts to paleontological resources.
- d) **Less than Significant with Mitigation Incorporated.** As noted in relation to archaeological and historical resources, the Codora Unit landform is relatively young and this, to a certain extent, precludes the presence of early and significant Native American sites or human interments. However, later-period native interments or undocumented historic-era human burials could be present in contexts that could be impacted by the proposed project. Disturbance or destruction of previously undocumented human remains would be a potentially significant impact. Implementation of the Mitigation Measure CR-2, outlined below, would reduce this impact to a less-than-significant level.

Mitigation Measure CR-2. Stop potentially damaging work if human remains are uncovered during project-related ground-disturbing activities, assess the significance of the find, and pursue appropriate management.

California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code Section 7050.5 and Section 7052 and California Public Resources Code Section 5097.

In accordance with the California Health and Safety Code, if human remains are found in any location other than a dedicated cemetery, the California Health and Safety Code requires that excavation is halted in the immediate area. The county coroner shall be notified and is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Section 7050.5[c]).

The responsibilities of the NAHC for acting upon notification of a discovery of Native American human remains are identified within the California Public Resources Code (PRC Section 5097.9). The NAHC is

responsible for immediately notifying the person or group it believes is the Most Likely Descendant (MLD). With permission of the legal landowner(s), the MLD may visit the site and make recommendations regarding the treatment and disposition of the human remains and any associated grave goods. This should be conducted within 24 hours of their notification by the NAHC (PRC Section 5097.98[a]). If an agreement for treatment of the remains cannot be resolved satisfactorily, any of the parties may request mediation by the NAHC (PRC Section 5097.94[k]). Should mediation fail, the landowner or the landowner's representative must re-inter the remains and associated items with appropriate dignity on the property in a location not subject to further subsurface disturbance (PRC Section 5097.98[b]).

Through agreement on the treatment and disposition of human remains reached between the MLD and the SRNWR with the assistance of the archaeologist, or through mediation by the NAHC, implementation of Mitigation Measure CR-2 would reduce potentially significant impacts associated with the discovery of human remains to a less-than-significant level.

3.6 GEOLOGY AND SOILS

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VI.	Geology and Soils. Would the project:				
a)	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i)	Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii)	Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii)	Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iv)	Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b)	Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c)	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d)	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

a,i-iv) The area of the SRNWR between Red Bluff and Chico Landing is underlain by sedimentary and volcanic deposits associated with the Tehama, Tuscan, and Red Bluff formations (Harwood and Helley 1982; Helley and Harwood 1985). On top of these formations lie terrace deposits, such as Riverbank and Modesto formations, as well as paleochannel deposits, alluvial fans, meanderbelt deposits, and basin and marsh deposits (Department of Water Resources 1994; Robertson 1987). The Modesto and Riverbank deposits flank the river in steps away from the channel and tend to erode at lower rates than other young deposits. These areas tend to form higher, more consolidated banks, and have a high proportion of Class I agricultural soils, including the Columbia and Vina loams.

The Codora Unit consists of Columbia silt loam, 0-2 percent slopes (Begg 1968). The soils on the western portion of the Codora Unit exist within old channels (oxbow lakes) of the Sacramento River (Columbia

silt loam, water table, 1-8 percent slopes). In that region the water table is permanently high (typically even with the Sacramento River) and the soils have poor drainage (Begg 1968). Columbia silt loam, 0-2 percent slopes, is a very deep soil that occurs on floodplains and formed in alluvium from mixed sources. This moderately well-drained soil has a moderately rapid permeability, negligible to medium runoff, and is subject to occasional to frequent flooding, depending on location and the presence of levees or other flood control structures. Columbia silt loam, 0-2 percent slopes, has been rated by the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) for suitability of various uses, including septic tank absorption fields and paths and trails.

The proposed project involves riparian habitat restoration. The project would not include the construction of any structures for human habitation, parking facilities, recreational facilities, septic tanks or leach fields. Therefore, the project would not expose people or structures to substantial adverse effects because of geologic conditions or seismic risk.

- i) **No Impact.** The project site is not designated as an Alquist-Priolo Fault study zone and no known surface faults are present under the project area (California Geological Survey 1999). The Alquist-Priolo Act was established to prevent damage and loss of life by discouraging the construction of structures designated for human habitation on a known active fault trace. Because the project would not be located on any known faults, and because surface ground rupture along faults is generally limited to a linear zone a few feet wide, fault ground rupture at the project sites is unlikely.
- ii) **Less-than-Significant Impact.** Glenn County is in a relatively inactive seismic area when compared to other portions of California such as the San Francisco Bay area. The nearest active fault to the project site is the Cleveland Hill Fault, which produced the Oroville Earthquake (Topozada and Morrison, Jr. 1982). This fault, which is part of the Foothills Fault System, produced an earthquake of magnitude 5.7 on the Richter Scale on August 1, 1975 in a location about 7 miles south of Lake Oroville. This event included a sequence of seven earthquakes at magnitudes of 4.5 or greater. Several other major active fault systems outside Glenn County are capable of producing earthquakes which could cause moderate to severe ground shaking within the County. These faults include the Bartlett Springs Fault, Battle Creek Fault, Midland-Sweitzer Fault, the Dunnigan Hills (Zamora) Fault, and the Green Valley Fault. Large earthquakes on the Maacama Fault, the Hayward Fault, and the San Andreas Fault could also affect the project site. Potentially active faults mapped on the Fault Activity Map of California (Jennings, 1994) could result in significant ground motion at the project site. Those faults within a 50 mile radius of the project site include: the Corning Fault, the Willows Fault, Chico Monocline, the Paskenta Fault, and the Cohasset Ridge Fault.

The California Geological Survey has determined that the closest faults (Cleveland Hill and Dunnigan Hills Faults) are both capable of generating a Maximum Credible Earthquake of magnitude 6.5 (Petersen, 1996). Other faults listed above are also capable of affecting the project site. However, the expected ground acceleration at the Project Site is very low, on the order of less than 0.1g (California Geological Survey 2008). Any damage to property or risk to the public from seismic shaking because of this project would be less than significant.

- iii) **Less-than-Significant Impact.** Liquefaction is a process by which water-saturated materials (including soil, sediment, and certain types of volcanic deposits) lose strength and may fail during strong ground shaking. Liquefaction occurs when a granular material is transformed from a solid state into a liquefied state as a result of increased pore-water pressure. Liquefaction is most commonly induced by strong ground shaking associated with earthquakes. Factors determining the liquefaction potential are soil type, the level and duration of seismic ground motions, the type and consistency of soils, and the depth to groundwater. The project site is rated as moderate for

liquefaction potential. Because of the distance from the project sites to known active faults and the fact that this project does not propose any structures intended for human habitation, hazards associated with liquefaction would be minor. This impact would be less than significant.

- iv) **Less-than-Significant Impact.** Slopes in the project area are generally less than 2%; therefore, landslides are determined not to be a hazard in the project area. The potential for people or structures to be affected by a landslide in the project area is low. This impact would be less than significant.

- b. **Less-than-Significant Impact.** The project site consists of flat agricultural land. Implementation of the project would be accomplished through the use of standard agricultural practices already being used on the project site, including orchard removal, including excavating rootballs, and disking/tilling, seeding, planting, and temporary herbicide use. Irrigation system modification and expansion would include standard trench and backfill techniques. Ground-disturbing activities associated with proposed project implementation are not expected to cause soil erosion and/or sedimentation of local drainages or the Sacramento River channel. Land-disturbing construction activities for the proposed project would be minimal because habitat restoration efforts would primarily involve planting operations entailing minimal tillage or grading. In orchard areas where trees are removed, native vegetation would be replanted directly following site preparation to prevent the possibility of severe erosion from disturbed, unprotected land.

As required in the NEPA EA (Appendix A), site preparation and restoration activities would occur during the dry season and standard agricultural grading and erosion control practices would be followed to avoid and minimize erosion. Therefore, project impacts to soil erosion or loss of topsoil are considered less than significant.

- c) **Less-than-Significant Impact.** The proposed project site is not located within a geologic unit or soil that is known to be unstable, based upon available data. There is a moderate potential for instability because of liquefaction or lateral spreading during an earthquake. There are no known problems because of liquefaction or subsidence to date in the project area. Therefore, the impact from these hazards is less than significant.
- d) **No Impact.** The proposed project site is underlain by soil with a low potential for soil expansivity. The Columbia Soil Series is a silt loam; expansive soils (expansive clays) are generally plastic clays. There would be no impact because of this project.
- e) **No Impact.** The proposed project does not involve the use or construction of a septic tank or alternative waste water disposal system.

3.7 HAZARDS AND HAZARDOUS MATERIALS

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VII.	Hazards and Hazardous Materials. Would the project:				
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
h)	Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

DISCUSSION

- a) **Less-than-Significant Impact.** Orchard removal, site preparation, and restoration activities could require the use of certain hazardous materials, such as fuels, oils, or other fluids associated with the operation and maintenance of vehicles and equipment. These materials would generally be contained within vessels engineered for safe storage. Large quantities of these materials would not be stored at or transported to the site.

The proposed restoration would not result in activities that could generate hazardous emissions. However, small quantities of hazardous materials such as herbicides or pesticides may be used on the project site. For instance, to abate nonnative plants, repeat application of herbicides would be used. The routine transport, use, and disposal of such materials would be limited and would not present a health risk when the materials are handled according to manufacturer's instructions. In addition, federal, state, and local laws regulate every aspect of hazardous materials transport, use, and storage. TNC and USFWS would follow all of Glenn County's requirements, Department of Pesticide Regulation's requirements and the USFWS Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area. These regulations are designed to avoid significant hazards to the public and environment.

Because only small quantities of hazardous materials are expected to be used, and because the project would be required to comply with all applicable existing regulations concerning hazardous materials, this impact would be less than significant.

- b) Less-than-Significant Impact.** There has been no known industrial use or construction of buildings in the project area that could have been a source of hazardous materials. The nearest cleanup site listed by the California Department of Toxic Substance Control is located in Willows (approximately 12 miles away) (CDTSC 2008).

A Level I Contaminants survey was conducted by USFWS and found no contaminants on the Codora Unit. However, the walnut orchard on the Codora Unit has historically had problems with surface drainage of fertilizers and pesticides into the river. This includes Manex, a heavy metal and carcinogen. The Codora Unit is subject to poor irrigation methods, including flood irrigation over the two large southeastern blocks of the orchard with no buffer. Other pesticides used at Codora include copper hydroxide, Confirm, Intrepid, GF-120, Apollo, and glyphosate. Malathion is no longer used because of its high level of environmental risk. The effects of both Manex and copper hydroxide are of concern to fish, especially sub lethal behavioral modifications.

Herbicides used for initial weed control would generally be applied at lower rates using chemicals less environmentally harmful (e.g., glyphosate) than those currently used for agricultural operations. Following completion of restoration activities, pesticide and herbicide use on the sites would cease, resulting in a net improvement to water quality. Orchard removal and other ground disturbing activities, which could potentially mobilize soils containing pesticides and herbicides historically used in agricultural operations, would be conducted during the dry season to reduce the potential for accidental discharge of these chemicals into the Sacramento River.

As stated in the Riparian Habitat Restoration Plan for the Codora Unit (Appendix B), TNC would follow all Glenn County and Department of Pesticide Regulation and USFWS Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area. Herbicide use will be reported to Glenn County as required by state and county law.

Because the Level I Contaminants survey found no contaminants on the Codora Unit, because ground disturbing activities would be conducted during the dry season, and because all applicable regulations would be followed in the application of herbicides, the proposed project would not pose a significant risk to onsite workers, the public, or the environment. The project's impact is considered less than significant.

- c) No Impact.** The closest school to the project site is located four miles south of the project site in Princeton, Colusa County (Google Maps 2008). However, children living in the vicinity of the project site would attend the nearest schools within Glenn County located in Willows (approximately 12 miles away). Therefore, there are no hazards or hazardous substance impacts expected to schools as a result of this project

- d) **No Impact.** The project site is not included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5. No area within the project site is currently restricted or known to have hazardous materials present. Therefore, no impact would occur within the project area.
- e,f) **No Impact.** Glenn County operates two Public General Aviation Airports: Orland Haigh (approximately 22 to the north northwest) and Willows Glenn (approximately 12 miles to the west northwest). There are also two private airstrips the Gunnersfield Ranch (10 miles southwest) and Richvale (12 miles east) (GAN 2008). Therefore, there would be no impact related to safety hazards within the vicinity of an airport or airstrip.
- g) **Less-than-Significant Impact.** All site preparation and restoration activities would occur on the project site and would not restrict access to, cause delays, or block any public roads. The traffic around the project site may be impacted only for short periods of time for delivery of construction materials or construction equipment. The project would not conflict with the emergency response plans for Glenn County. Therefore, the impact of this project would be less than significant.
- h) **Less-than-Significant Impact.** The project site is within a Federal Responsibility Area, as mapped by the California Department of Forestry and Fire Protection (Calfire 2007). The Department of the Interior fire management policy requires that all refuges with vegetation that can sustain fire must have a Fire Management Plan (FMP) that details fire management guidelines for operational procedures and values to be protected/ enhanced. The FMP for the SRNWR (provided in Appendix E of the Final CCP, June 2005) provides guidance on preparedness, prescribed fire, wildland fire, and prevention. The Codora Unit, which is within the SRNWR, would be managed for fire safety in compliance with the SRNWR FMP. Therefore, the project would result in a less-than-significant impact related the risks associated with wildland fire.

3.8 HYDROLOGY AND WATER QUALITY

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII.	Hydrology and Water Quality. Would the project:				
a)	Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e)	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g)	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h)	Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i)	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j)	Result in inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

Surface Water. The Sacramento River Basin is the largest in California collecting runoff from the Sierra Nevada Mountains to the east, the Cascade and Trinity Mountains to the north, and the Coast Ranges to the west before flowing by the project site. Despite the number of dams along the Sacramento River (permanent dams – Shasta Dam and Keswick Dam; seasonal dams – Anderson-Cottonwood Irrigation District Dam and Red Bluff Diversion Dam), flow does fluctuate throughout the year having seasonally high flow during the winter and spring months.

Flooding. Flooding issues could occur in the project area because it is located within the Federal Emergency Management Agency (FEMA)-designated 100-year floodplain (FEMA 2008). The designation is defined as an area with a 1% chance of being inundated annually. With the proximity of the Sacramento River and the presence of a slough approximately ¼ mile north of the parcel, inundation in this area could be more frequent than noted by FEMA. According to the California Department of Water Resources, the Codora Unit floods every 1 to 5 years with the 274.5-acre restoration area in the 4-year estimated flood frequency interval.

Groundwater. The project site is located within the Colusa groundwater sub-basin, part of the larger Sacramento Valley Groundwater Basin (DWR 2004). This sub-basin is composed of waterbearing deposits from the late Tertiary to Quaternary age. The different deposits include unconsolidated gravel, silt, sand, and clay from erosion and/or stream and river flood events. From the City of Willows to the Sacramento River, geologic units include Holocene alluvial deposits, Pleistocene deposits of Riverbank and Modesto formations, and Pliocene deposits of Tehama and Tuscan formations. The groundwater level does not show increasing or decreasing trends from water consumption. The predominant water types within the sub-basin are calcium-magnesium bicarbonate and magnesium-calcium bicarbonate. Wells into the sub-basin for municipal/irrigation reach a depth between 20 to 1340 feet (DWR 2004).

Water Quality. The SRNWR lies within the jurisdiction of the Central Valley Regional Water Quality Control Board (CVRWQCB), which established beneficial uses and water quality objectives for surface water and groundwater in the Water Quality Control Plan (Basin Plan) for the region. Because the Sacramento River originates as snowmelt, it is of excellent water quality; therefore, it supports all existing beneficial uses of the Basin Plan, including domestic, agricultural, and industrial water supply; recreation; wildlife habitat; cold and warm freshwater fish habitat; and migration and spawning for salmonid fisheries (CVRWQCB 2007). The water is considered soft, moderately alkaline, and low in dissolved solids, with high turbidity during peak runoff periods. However, the Sacramento River is listed as impaired on the U.S. Environmental Protection Agency's (EPA) Section 303 (d) list of water bodies for the pesticide diazinon, and trace metals (including mercury, cadmium, copper, and zinc).

a,f) Less Than Significant with Mitigation Incorporated. As explained in the Hazardous Materials section, above, a Level I Contaminants survey was conducted by USFWS and found no contaminants on the Codora Unit. However, the walnut orchard on the Codora Unit has historically had problems with surface drainage of fertilizers and pesticides into the river. This includes Manex, a heavy metal and carcinogen. The Codora Unit is subject to poor irrigation methods, including flood irrigation over the two large southeastern blocks of the orchard with no buffer. Other pesticides used at Codora include copper hydroxide, Confirm, Intrepid, GF-120, Apollo, and glyphosate. Malathion is no longer used because of its high level of environmental risk. The effects of both Manex and copper hydroxide are of concern to fish, especially sub lethal behavioral modifications.

Herbicides used for initial weed control would generally be applied at lower rates using chemicals less environmentally harmful (e.g., glyphosate) than those currently used for agricultural operations. Following completion of restoration activities, pesticide and herbicide use on the sites would cease, resulting in a net improvement to water quality. Orchard removal and other ground disturbing activities, which could potentially mobilize soils containing pesticides and herbicides historically used in

agricultural operations, would be conducted during the dry season to reduce the potential for accidental discharge of these chemicals into the Sacramento River.

As stated in the Riparian Habitat Restoration Plan for the Codora Unit (Appendix B), TNC would follow all Glenn County and Department of Pesticide Regulation and USFWS Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area. Herbicide use will be reported to Glenn County as required by state and county law.

The project site consists of flat agricultural land. Implementation of the project would be accomplished through the use of standard agricultural practices already being used in the vicinity of the project site. These activities would include orchard removal, including excavating rootballs, and disking/tilling, seeding, planting, and temporary herbicide use. Irrigation system modification and expansion would include standard trench and backfill techniques. During site preparation and implementation of the habitat restoration project, a release of sediment to surface waters could occur. Other impacts to water quality could result from releases of fuels, oils, or other fluids from vehicles and construction equipment during project implementation. These potential, accidental releases could result in a violation of water quality standards.

The CVRWQCB administers the NPDES stormwater permit program for non-agricultural general construction activities that disturb more than 1 acre. Activities associated with implementation of the proposed project would not involve ground disturbances like those associated with general construction projects as defined by the CVRWQCB. Site preparation and restoration activities would occur during the dry season and standard agricultural grading and erosion control practices would be followed to avoid and minimize potential discharges of contaminated runoff, erosion, sediment discharge and flood debris. However, to ensure the project results in less-than-significant impacts to water quality, Mitigation Measure Hydro-1, described below, would be implemented. This measure is consistent with the measures required by the NEPA EA to address impacts to water quality (Appendix A).

In the long-term, restored riparian vegetation on the Codora Unit would have some filtering effect on overland flow by removing floating debris, minimizing erosion, and capturing sediment. Replacing flood-prone agriculture with restored riparian habitat would decrease pesticide and herbicide applications on land adjacent to the Sacramento River, thereby increasing water and sediment quality. Restored riparian forests also buffer and filter toxic and organic matter that originate further away from the river, further enhancing water and sediment quality.

Mitigation Measure HYDRO-1: Implement Erosion Control and Spill-Prevention Measures.

- ▶ A variety of sediment control measures such as buffers or set backs from the river, silt fences, straw or rice bale barriers, brush or rock filters, sediment traps, fiber rolls, or other similar linear barriers will be placed at the edge of the project area to prevent sediment from flowing off site.
- ▶ The contractor will establish a spill-prevention and countermeasure plan before project construction begins; this plan will include on-site handling criteria to avoid input of contaminants to the waterway. A staging, washing, and storage area will be provided at least 100 feet away from the waterway for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants.
- ▶ No ground disturbing work will occur within the active channel of the Sacramento River.
- ▶ Only state and locally approved herbicides will be used on the restoration site.
- ▶ Herbicide applications will be prescribed by a state-licensed PCA (pest control advisor) and applied by state licensed applicators.

- b) No Impact/Beneficial Impact.** Areas restored to native riparian habitat would be temporarily irrigated to assist with plant establishment. Irrigation is expected to be required for three years following initial planting of the site. The project would use a water efficient microdrip hard hose sprinkler system that would reduce water consumption by approximately 75% compared to the current agriculture water use at Codora. Once plants have become established, irrigation of the site would cease and the microdrip irrigation system would be removed and recycled. Therefore, the total demand for irrigation water would be greatly reduced by implementation of the project, resulting in a net recharge of the regional aquifer relative to current conditions. This impact is considered beneficial.
- c,e) No Impact.** There are no creeks, streams, or drainages that would be altered by project implementation. Additionally, the project site is not served by a stormwater drainage system; therefore, the project would have no impact on stormwater drainage systems. See (a), above for a discussion of the project's water quality impacts.
- d) Less-Than-Significant Impact.** According to the California Department of Water Resources, the Codora Unit floods every 1 to 5 years, with an estimated 4-year flood return interval for the 274.5-acre restoration area. Removing the existing orchard and restoring riparian habitat would reduce Manning's Roughness Coefficient from 0.100 for orchards to 0.040 for savanna (Ayers Associates 2005, 2007). Reducing vegetation roughness within the Codora Unit should maintain, or possibly reduce, flood frequencies within surrounding areas because of improved floodwater conveyance through the project area. Therefore, implementation of the restoration design would achieve flood neutrality with water surface elevations either being slightly reduced or remaining the same. Thus, this impact is considered less than significant.
- g,h,i) No Impact.** No housing or other structures would be constructed as part of the project. Therefore, no impacts would occur.
- j) No Impact.** The project is not located in an area that would be affected by tsunamis, seiche, or mudflows.

3.9 LAND USE AND PLANNING

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IX.	Land Use and Planning. Would the project:				
a)	Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

- a) **No Impact.** The project would be located along the Sacramento River surrounded by other areas of open space and agriculture. The proposed project would restore native riparian habitats within the SRNWR, consistent with the mission of the SRNWR mission and the surrounding native and restored riparian habitats within SRNWR. There are no established communities that would be divided by the project.
- b) **No Impact.** The proposed project consists of Assessor's Parcel Number(s) (APN) 013-180-17 and 013-140-19 both of which are zoned AE-40 (Exclusive Agricultural Zone, 36 acre minimum). The Glenn County general plan is currently undergoing revision, and their "preferred alternative" version lists Codora as "Public Facilities & Open Space." The current existing plan lists Codora as "Agriculture & Resource Lands." The change in land use from agriculture to riparian habitat was approved previously and the site has remained as agriculture with the understanding that it would eventually be restored to native habitats.

The proposed action would be compatible with Glenn County land use policies. Restoring the Codora Unit to riparian habitat would preserve open space, provide passive recreational opportunities, and improve the quality of wildlife habitat. The project would protect water quality and quantity by providing a buffer strip between agricultural activities and the Sacramento River. Groundwater wells would also be removed following restoration, which should result in a net recharge of the regional aquifer. By preserving this land as wildlife habitat and open space, further protection against urban encroachment would be secured. The Glenn County Board of Supervisors (2008) encourages the proposed action because it would lead to public land being restored and made available for public recreational use.

- c) **No Impact.** There are no habitat conservation plans, natural community conservation plans, or similar documents that cover the proposed project area.

3.10 MINERAL RESOURCES

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
X.	Mineral Resources. Would the project:				
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

- a,b) No Impact.** The California Surface Mining and Reclamation Act of 1975 requires the State Geologist to classify land into Mineral Resource Zones according to the known or inferred mineral potential of that land without regard to land use or land ownership. This has not occurred for Glenn County, so areas of known mineral resources are limited to existing mining areas (Glenn County, 1997).

Historically, the primary mineral resource in Glenn County and in the surrounding area has been the extraction of construction-grade aggregate material. Currently, there are no permitted mining operations along the Sacramento River in Glenn County or in nearby Butte County (Glenn County, 1997). There are also several gas fields in Glenn County that contribute to the production of natural gas, however there are non in close proximity to the project site.

There are no documented mineral resources at the proposed project site. Additionally, restoration of the project sites to riparian habitat would not involve extraction of mineral resources and would not prohibit access to extract mineral resources. Therefore, the project would not result in the loss of availability of a known mineral resource or otherwise affect mineral resources and no impact would occur.

3.11 NOISE

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XI.	Noise. Would the project result in:				
a)	Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b)	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c)	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ACOUSTIC FUNDAMENTALS

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature, and can vary substantially from person to person.

A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar or the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel scale was introduced. A sound level expressed in decibels is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure. For sound pressure in air the standard reference quantity is generally considered to be 20 micropascals (μPa), which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; as such it does not follow normal algebraic methods and cannot be directly added. For

example, a 65 decibel (dB) source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100 fold increase in acoustical energy.

The loudness of sound preserved by the human ear is dependent primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels, (abbreviated dBA). For this reason the dBA can be used to predict community response to environmental, and transportation noise. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

Noise can be generated by a number of sources, including mobile sources (transportation noise sources), such as automobiles, trucks and airplanes; and stationary sources (non-transportation noise sources), such as construction sites, machinery, commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (decrease) dependent on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (walls, building facades, berms). Noise generated from mobile sources generally attenuate at a rate of 4.5 dB per doubling of distance (dB/DD). Stationary noise sources spread with more spherical dispersion patterns which attenuate at a rate of 6 dB to 7.5 dB/DD.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise, and affect levels at a receiver. Furthermore, the presence of a large object (barrier) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction or “shielding” provided by a barrier is primarily dependent upon the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural barriers such as berms, hills, or dense woods, and manmade features such as buildings and walls may be used as noise barriers.

The intensity of environmental noise changes over time, and several different descriptors of time-averaged noise levels are used. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment. The noise descriptors most often used to describe environmental noise are defined below:

- ▶ L_{\max} (Maximum Noise Level): The highest A/B/C weighted integrated noise level occurring during a specific period of time.
- ▶ L_n (Statistical Descriptor): The noise level exceeded n percent of a specific period of time, generally accepted as an hourly statistic. An L_{10} would be the noise level exceeded 10 % of the measurement period.
- ▶ L_{eq} (Equivalent Noise Level): The energy mean (average) noise level. The steady state sound level which, in a specified period of time contains the same acoustical energy as a varying sound level over the same time period.
- ▶ L_{dn} (Day-Night Noise Level): The 24-hour L_{eq} with a 10 dB “penalty” applied during nighttime noise-sensitive hours, 10:00 p.m. through 7:00 a.m. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

GLENN COUNTY GENERAL PLAN

The Glenn County General Plan Public Safety Element contains specific goals, and policies for the determination of a proposed projects compatibility with surrounding land uses. The following are goals and policies applicable to the proposed project:

- ▶ **Goal: PSG-7 Protection** of county residents from the harmful and annoying effects of exposure to excessive noise and preservation of the rural noise environment in Glenn County.

Policies:

It shall be the policy of Glenn County to:

- ▶ PSP-49 Regulate fixed noise sources within the county through the adoption of a local Noise Control Ordinance.
- ▶ PSP-51 Require acoustical analyses for any development proposal which does not meet the recommended noise level standards, subject to the requirements contained in this General Plan.
- ▶ PSP-52 Require that noise mitigation measures necessary to achieve compliance with land use compatibility guidelines and noise level standards be incorporated into site planning and project design.
- ▶ PSP-53 Encourage the separation of noise sensitive uses and high noise generating uses.

GLENN COUNTY UNIFIED DEVELOPMENT CODE

The Glenn County Unified Development Code provides specific noise level standards to be applied to new projects in Title 15, Division 4 Development Standards, Part 1 Performance Standards, Chapter 560 Performance Standards, Section 100 Noise. The specific noise level standards applicable to the proposed project are listed below:

- ▶ A. Maximum sound emissions for any use shall not exceed equivalent sound pressure levels in decibels, A-weighted scale, for any one hour as stipulated in Table B (Table 3-4, below). These maximums are applicable beyond any property lines of the property containing the noise.

Table 3-4 Maximum One-hour Equivalent Sound Pressure Levels (A-Weighted - dBA)			
Time of Day	Receiving Property Zoning District		
	Residential	Commercial	Industrial
7:00 - 10:00 p.m.	55	60	65
10:00 - 7:00 a.m.	45	55	60
Notes: The residential category also includes all resource zoning districts. (Table B of the Glenn County General Plan Safety Element) Source: Glenn County General Plan Public Safety Element 1993			

- ▶ B. In the event the receiving property or receptor is a dwelling, hospital, school, library or nursing home, even though it may be other wise zoned for commercial or industrial and related uses, maximum one-hour equivalent sound pressure received shall be as indicated in Table C (Table 3-5, below).

Table 3-5 Maximum One-hour Equivalent Sound Pressure Levels (A-Weighted - dBA)	
Time of Day	Level
7:00 - 10:00 p.m.	57
10:00 - 7:00 a.m.	50
Notes: (Table C of the Glenn County General Plan Safety Element) Source: County of Glenn County Codes 1975	

- F. Exemptions. Local noise standards set forth in this section do not apply to the following situations and sources of noise, provided standard reasonable practices are being followed:

- Construction site sounds between 7:00 a.m. and 7:00 p.m.

Title 15, Division 4 Development Standards, Part 1 Performance Standards, Chapter 560 Performance Standards, Section 130 Vibrations exempts temporary construction work from ground vibration as stated below:

No use shall generate ground vibration which is perceptible without instruments beyond the lot line. Ground vibration caused by motor vehicles, aircraft, temporary construction work or agricultural equipment are exempt from these standards.

EXISTING NOISE ENVIRONMENT

The project site is located south of SR 162 and east of SR 45 within Glenn County. Existing noise-sensitive land uses in the vicinity include rural residences located to the west and east of the project site along SR 162 and Road XX, the closest of which is approximately 1,200 feet away from the property line and approximately 1,300 feet away from the location of highest potential construction activity. There is no other nearby noise-sensitive land uses in the vicinity of the project site.

The existing noise environment within the project area is primarily influenced by surface-transportation noise emanating from vehicular traffic on SR 162 and SR 45. Intermittent agricultural noise from adjacent agricultural uses also influences the existing noise environment. The dominant noise source in the vicinity of the project site is vehicular traffic on nearby roadways. Traffic on SR 162 and SR 45 contribute the highest noise levels from this source in the project area. Thus, existing roadway traffic noise levels were modeled for segments of SR 162 and SR 45 near the project site using the Federal Highway Administration (FHWA) Traffic Noise Prediction Model (RD-77-108, 1978) (Refer to Table 3-6).

Table 3-6 Modeled Existing Vehicular Traffic-Noise Levels				
Roadway Segment	Distance (feet) from Roadway Centerline to L _{dn} Contour (dB)			L _{dn} (dB) 100 Feet from Centerline
	70 L _{dn}	65 L _{dn}	60 L _{dn}	
State Route 45 – Junction 162 to the North	25	54	116	61.0
State Route 162 – Junction 45 to the East	32	69	148	62.5
Notes: Modeled noise levels do not consider any shielding or reflection of noise by existing structures or terrain features or noise contribution from other sources and where: L _{dn} = Day-Night Level is the energy-average of the A-weighted noise levels during a 24-hour period with 10 dB added to the night (10 p.m. to 7 a.m.) hours. Refer to Appendix D for modeling input parameters and output results. Source: Modeled by EDAW 2008, Caltrans 2007: 79, 219				

Table 3-6 presents the modeled Day-Night noise levels (L_{dn}) at 100 feet from the centerline of SR 45 and SR 145 and the distance from the roadway centerline to the L_{dn} contours of interest based on existing average daily traffic (ADT) volumes and heavy and medium truck mix percentages from the California Department of Transportation (Caltrans) (Caltrans 2007: 79, 219) (Appendix D).

DISCUSSION

a) Temporary Construction Noise

Less than Significant with Mitigation Incorporated. Construction generally occurs in several discrete phases; each phase requires a specific complement of equipment with varying equipment type, quantity, and intensity. These variations in the operational characteristics of the equipment change the effect they have on the noise environment in the project vicinity. The effect of construction noise largely depends on the construction activities being performed on a given day, noise levels generated by those activities, distances to noise-sensitive receptors, and the existing ambient noise environment at the receptors. The orchard removal, field preparation and layout for the habitat restoration, which would involve ground disturbance and material transport, would occur from spring 2009 through spring 2010. On-site construction equipment used during site preparation would include scrapers, dozers, loaders, agricultural tractors, and trucks. Table 37 depicts the noise levels generated by various types of construction equipment.

Table 3-7 Construction Equipment Noise Emission Levels	
Equipment Type	Typical Noise Level (dB) @ 50 feet
Scraper	84
Dozer	82
Front-end Loader	79
Tractor	84
Trucks	74-81
Note: Assumes all equipment fitted with properly maintained and operational noise control device, per manufacturer specifications. Source: Bolt, Beranek, and Newman 1981, Federal Transit Administration 2006: 12-6.	

As indicated in Table 3-7 operational noise levels for project construction activities would range from 79 dB to 84 dB at a distance of 50 feet. Continuous combined noise levels generated by the simultaneous operation of the loudest pieces of equipment would result in noise levels of 89 dB at 50 feet. Accounting for the usage factor of individual pieces of equipment, topographical shielding and ground absorption effects; construction activities on the project site would be expected to result in hourly average noise levels of 87 dB L_{eq} at a distance of 50 feet. Maximum noise levels generated by construction activities are not predicted to exceed 84 dB L_{max} at 50 feet.

The closest noise-sensitive receptor in the project vicinity is the rural residential land use located west of the project site, 1,300 feet to the east and 1,500 feet from the acoustical center of construction activities. Noise from localized point sources (such as construction sites) typically decreases by 6 to 7.5 dB with each doubling of distance from source to receptor. Conservatively assuming an attenuation rate of 6 dB per doubling of distance, construction operations and related activities are predicted to generate exterior hourly noise levels of 57.4 dB L_{eq} at the nearest off-site sensitive receptor, when propagated from the acoustical center of construction operations.

Construction operations that occur during the hours of 7 a.m.-7 p.m. Monday through Friday are exempt from the applicable standards. However, if construction operations were to occur during the noise-sensitive hours of 7 p.m.-7 a.m. Monday through Friday, the applicable noise standards could potentially be exceeded at residential dwellings near the project site. In addition, construction operations

occurring during the evening and nighttime hours may result in annoyance and/or sleep disruption to occupants of the nearby residential dwellings. Thus, if construction operations are not limited to the hours exempt from the standards set forth in the Glenn County Unified Development Code, the temporary construction noise associated with onsite equipment could potentially expose sensitive receptors to or generate noise levels in excess of the applicable noise standards and/or result in a noticeable increase (3 dB) in ambient noise levels. This impact is considered potentially significant. Implementing Mitigation Measures N-1 and N-2 would ensure that noise impacts during construction would be reduced to a less-than-significant level.

Mitigation Measure N-1: Equip Construction Equipment with Noise Controls and Maintain according to Manufacturers' Specifications.

USFWS shall require construction contractors to ensure that, to the extent feasible, construction equipment shall be properly maintained and equipped with noise controls, such as mufflers, in accordance with manufacturers' specifications.

Mitigation Measure N-2: Limit Construction to Hours Permitted in Applicable Standards.

Construction operations involved with the proposed project shall be limited to the hours of 7 a.m.-7 p.m. Monday through Sunday, during which such activities are exempt from noise levels identified in the applicable standards.

- b) Less-than-Significant Impact.** Construction activities have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. While effects of ground vibration may be imperceptible at low levels, they may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in structural damage.

A Caltrans guideline recommends a standard of 0.2 inches per second (in/sec) peak particle velocity (PPV) for the protection of normal residential buildings and 0.08 in/sec PPV for the protection of old or historically significant structures (Caltrans 2004: 15). With respect to human response for residential uses (i.e., annoyance), the Federal Transit Administration recommends maximum acceptable vibration standard of 80 velocity decibels (VdB) (Federal Transit Administration 2006: 12-12). Ground vibration levels associated with various types of construction equipment are summarized below in Table 3-8.

Table 3-8 Representative Vibration Source Levels for Construction Equipment			
Equipment		PPV at 25 feet (in/sec)¹	Approximate Lv (VdB) at 25 feet²
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Trucks		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58
Notes: 1 Where PPV is the peak particle velocity			
2 Where Lv is the velocity level in decibels (VdB) and based on the root mean square (RMS) velocity amplitude.			
Source: Federal Transit Administration 2006: 12-12			

The proposed project would not involve the use of any equipment or processes that would generate potentially high levels of ground vibration, such as pile drivers. Construction operations associated with the proposed project would be anticipated to include loaders, dozers, and trucks; no pile driving would occur. Ground vibration generated during construction would be primarily associated with on-site truck activity. As shown in Table 3-8, trucks typically generate vibration levels of less than 0.08 in/sec PPV or 86 VdB at 25 feet. At the nearest vibration sensitive structure, rural residence described above, this level would not exceed the Caltrans-recommended standards of 0.2 in/sec PPV or 80 VdB and therefore, there would be no potential for structural damage or annoyance to persons. Because the temporary construction vibration associated with on-site equipment would not be anticipated to expose sensitive receptors to or generate excessive groundborne vibration or groundborne noise levels, this impact would be considered less than significant. No mitigation is required.

- c) **Less-than-Significant Impact.** The project involves riparian habitat restoration. It does not include construction of any long-term on-site stationary noise sources and would not result in an increase in vehicle miles traveled or off-site operational traffic source noise. Therefore, the project would not result in the exposure of persons to or generation of noise levels in excess of applicable standards or create a substantial permanent increase in ambient noise levels in the project vicinity. As a result, this impact would be less than significant
- d) **Less than Significant with Mitigation Incorporated.** As analyzed in item (a), above, temporary onsite construction operations could potentially result in noise levels of approximately 87 dB at 50 feet from the proposed project site. If construction operations were to occur during the noise-sensitive hours between 7 p.m. and 7 a.m. Monday through Friday, the applicable noise standards could potentially be exceeded at the nearby residential dwellings located in the proposed project area. In addition, if construction operations occur during noise-sensitive hours, increases in ambient noise levels may potentially result in a noticeable increase (3 dB) in the ambient noise environment. Thus, the short-term construction noise associated with onsite equipment could potentially result in a substantial temporary or periodic increase in ambient noise levels in the proposed project vicinity if construction operations are not limited to the daytime hours exempt from the standards set forth in the Glenn County Unified Development Code. This impact is considered significant. By implementing Mitigation Measures N-1 and N-2, described above for item (a), USFWS would ensure that temporary construction-related noise impacts would be reduced to a less-than-significant level.
- e,f) **No Impact.** Glenn County operates two Public General Aviation Airports: Orland Haigh (approximately 22 to the north northwest) and Willows Glenn (approximately 12 miles to the west northwest). There are also two private airstrips the Gunnersfield Ranch (10 miles southwest) and Richvale (12 miles east) (GAN 2008). Therefore, there would be no impacts related to exposing people to excessive noise because of airports or airstrips.

3.12 POPULATION AND HOUSING

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XII.	Population and Housing. Would the project:				
a)	Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

a,b,c) No Impact. The project site would be restored to riparian habitat, which would not induce substantial population growth because the project would not provide residential, commercial, or industrial development or new infrastructure, such as roads or utilities, to support additional development. Furthermore, as part of SRNWR, the project site would be protected and preserved for their natural resources and public recreation opportunities. Therefore, the project would have no impact on population growth.

The project site is currently occupied by walnut orchards. There are no residences on the project site. No housing would be demolished and no people would be displaced as a result of the proposed project. The project would not result in the need to construct replacement housing.

The displacement of agricultural production because of orchard removal on the Codora Unit would not represent a substantial loss of employment opportunities in Glenn County. Employment growth is expected to increase over the next several years, as a result of growth in the non-farm sector. As a result, any reduction in employment from taking the Codora Unit out of agricultural production would be offset by this growth.

3.13 PUBLIC SERVICES

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII.	Public Services. Would the project:				
a)	Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
	Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

a) Fire protection

Less-than-Significant Impact. The project would not result in any changes to the projected population of the area. Restoration of the walnut orchards to riparian habitat may increase the number of visitors to the project area and would not cause a substantial demand on fire protection. This impact would be less than significant.

Police protection

Less-than-Significant Impact. The project would not result in any changes to the projected population of the area. Restoration of the walnut orchards to riparian habitat may result in increased visitors to the SRNWR. The SRNWR has 3 full time law enforcement officers that regularly patrol all SRNWR units in addition to 6 support staff providing technical, educational, and administrative support for the operation of all Refuge properties along the Sacramento River. Therefore, the project would not cause a substantial increase in demand for police protection. This impact would be less than significant.

Schools

No Impact. The project would not include the construction of housing or commercial businesses and therefore would not generate additional students or increased demands on schools. Therefore, the project would have no impact on schools.

Parks

No Impact/Beneficial Impact. The project would result in the restoration of riparian habitat, consistent with the purposes of the SRNWR. The restored habitat would enhance natural habitat and increase publicly accessible park lands. Therefore, the project would have a beneficial impact on parks and would not generate the need for other new or physically altered parks.

3.14 RECREATION

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV.	Recreation. Would the project:				
a)	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

- a,b) No Impact/Beneficial Impact.** The project would result in the restoration of riparian habitat, consistent with the purposes of the SRNWR. The increase in natural habitat in SRNWR may generate an increase in use of SRNWR trails and facilities; however, it is not anticipated to result in the acceleration of physical deterioration of the SRNWR. Rather, the enhancement of the SRNWR and the increased use of the park facilities would be a beneficial impact.

3.15 TRANSPORTATION/TRAFFIC

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XV.	Transportation/Traffic. Would the project:				
a)	Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b)	Exceed, individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Result in inadequate parking capacity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

a,b) Less-Than-Significant Impact. The proposed Codora Unit restoration site occurs along the west side of the Sacramento River in the southeastern portion of Glenn County, California near the intersection of SR 162 and 45. SR 162 serves as the northern boundary of the Codora Unit. From the eastern city limit of Willows to the Butte County line, traffic ranges from 1,650 to 2,850 vehicles per day, with 12 percent as truck traffic (Glenn County 1993). California Department of Transportation (Caltrans) lists the section of State Route 162 that borders the project site as part of the California Legal Truck Network permitting passage to tractor-trailer trucks 65 feet long and double tractor-trailer trucks 75 feet long (Caltrans 2007). State Route 162 is classified as an "A" or "B" Level of Service (LOS) within the vicinity of the Codora Unit (Glenn County 1993). The LOS thresholds within Glenn County are "A" – 0-2300 daily vehicles and "B" – 2,300-4,600 daily vehicles (Glenn County 1993). County roads within Glenn County serve rural transportation needs including: logging, recreation, residential, and farm-to-market trips (Glenn County 1993).

The planned restoration of the project site as well as ongoing recreational activities may result in a small increase in traffic volume relative to the existing traffic and congestion along SR 162 in the vicinity of the Codora Unit. A small number of construction vehicles may be visiting the project site during the initial site preparation, maintenance and monitoring period, perhaps generating an additional one to two dozen

vehicle trips per day, at most, during this three-year period. The number of additional vehicle trips generated by recreational users of the project site on an ongoing basis is unknown. However, given the relatively rural nature of the surrounding region and the types of recreational activities that would be accommodated by the habitat restoration project, it is reasonable to assume conservatively that no more than 100 additional vehicle trips (and probably much less than this) would be generated by the project on an ongoing basis.

The LOS designation for this section of SR 162 is “B”, which permits up to 4600 vehicles daily. The current use is approximately 2,850 vehicles daily (DPR 2008). Therefore, the “excess” capacity of this section of SR 162 is approximately 1,700 vehicles daily. Implementation of the project would not exceed this excess capacity either individually or cumulatively. This impact is less than significant.

- c) **No Impact.** Glenn County operates two Public General Aviation Airports: Orland Haigh (approximately 22 to the north northwest) and Willows Glenn (approximately 12 miles to the west northwest). There are also two private airstrips the Gunnersfield Ranch (10 miles southwest) and Richvale (12 miles east) (GAN 2008). The project site is not located in an airport use plan (i.e., within two miles of a public airport) nor is it in the vicinity of a private air strip. Therefore, no part of the proposed project would affect or change existing air traffic patterns.
- d,e) **No Impact.** The proposed habitat restoration project would not result in any changes to local roadways, new roads/access routes, or new parking facilities. All construction staging and parking for construction-related vehicles would occur on the project site. The project would not impede any roadways and would therefore not impede emergency access to the project site or surrounding areas. In addition, the project would result in the removal of the existing orchard and the cessation of the use of agricultural farm equipment. Therefore, the project would not increase hazards because of a design feature or incompatible uses.
- f) **No Impact.** Parking and pedestrian access to the Codora Unit would be provided at the existing parking area and pedestrian gate on the adjacent SRNWR Sul Norte Unit (see Exhibit 2-4). No new parking would be necessary nor constructed in association with the proposed habitat restoration project.
- g) **No Impact.** Glenn County does not currently have a public transit service or other modes of alternative transportation. There are no specific bicycle lanes in the county. In addition, there are no policies, plans, or programs supporting alternative transportation that would include the project site (Glenn County 1993).

3.16 UTILITIES AND SERVICE SYSTEMS

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI.	Utilities and Service Systems. Would the project:				
a)	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g)	Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

DISCUSSION

- a-g) No Impact.** The site currently does not contain any utilities or other service systems, and none would be installed as part of the project. Limited trash collection would occur on-site; however, the amount of trash and other refuse collected would not be a significant contributor to the local landfill. Therefore, the project would not impact utilities and service systems.

3.17 MANDATORY FINDINGS OF SIGNIFICANCE

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. Mandatory Findings of Significance.				
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<small>Authority: Public Resources Code Sections 21083 and 21087. Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.3, 21093, 21094, 21151; <i>Sundstrom v. County of Mendocino</i>, 202 Cal.App.3d 296 (1988); <i>Leonoff v. Monterey Board of Supervisors</i>, 222 Cal.App.3d 1337 (1990).</small>				

DISCUSSION

- a. **Less than Significant with Mitigation Incorporated.** Consistent with the goals of the project, implementation of the proposed project would result in an overall benefit to biological resources. Short-term benefits would include the elimination of pesticide application to the area as well as increased habitat complexity. The project would have a long-term benefit to wildlife because the restored native forest and savannah cover types would provide food and cover for a variety of riparian-dependent species, compared with the existing orchard. Specifically, removal of the existing orchard could result in potentially significant adverse impacts to nesting raptors, special status birds and migratory birds. However, this would be mitigated by implementation of Mitigation Measures Bio-1 and Bio-2. The project would result in less-than-significant impacts to VELB and American badger. Riverine fish fauna would benefit from the maintenance of sediment deposition, habitat diversity, restored shaded riverine aquatic habitat, overhanging vegetation, and seasonally available spawning and rearing habitats. Three special-status plant species have potential to occur in riparian and freshwater marsh habitats on the project site; however, none of these habitats would be adversely affected by the proposed restoration project, and the project would result in a long-term increase in the overall amount of sensitive habitat that could support special-status plant species within the project area. Therefore, impacts on special-status plants would also be beneficial.

The proposed project was also evaluated for the potential significant adverse impacts to the cultural resources. Activities associated with the proposed project could have the potential to significantly disturb historic or archaeological resources. However, full integration of Mitigation Measures Cultural-1 and Cultural-2 included in this project would reduce those impacts, both individually and cumulatively, to a less than significant level.

- b) Less-than-Significant Impact.** Cumulative impacts are those effects on the environment resulting from incremental consequences of the proposed project when added to other past, present, and reasonably foreseeable future projects, regardless of who undertakes these actions. Cumulative effects can be the result of individually minor impacts, which can become significant when added over a period of time. Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area.

The proposed project would have long-term benefits for native wildlife species and habitats within the Codora Unit, as well as the neighboring Packer and Sul Norte Units of the SRNWR. The development and protection of wildlife habitats within the SRNWR would represent a benefit to the long-term conservation of threatened and endangered species and other native wildlife species. The project would provide a mosaic of riparian habitat types that could promote higher faunal diversity.

The hydraulic model used to evaluate the effects of the proposed project models the Beehive Bend Subreach of the Sacramento River between River Mile 163 to 176 taking into account all known past and projected restoration projects planned along the 13-mile stretch. Agricultural land use changes were also updated as part of the modeling exercise taking into consideration the cumulative effects of land use changes throughout the Beehive Bend Subreach (Ayers 2005 and 2007). The modeling results of the proposed project by Ayers Associates (2005) meet all evaluation criteria (water surface elevation, freeboard). By converting areas of orchard to savanna habitat, water surfaces would be reduced which would compensate for converting other areas to riparian vegetation. The proposed restoration configuration takes into account areas where water surface elevations are especially sensitive to additional riparian plantings, including the SR162 bridge at RM 168.5. The proposed project results in minimal change to water surface elevation and freeboard over existing conditions. The flood neutrality of the system will be maintained within the project area. Ayres also concluded that there would be no impacts to the overflows into the Butte Basin.

There are many projects that benefit wildlife and habitats on the Sacramento River. The establishment of the SRNWR and restoration that will be accomplished under the Restoration EA (USFWS 2002) both provide beneficial effects. The SRNWR is also one of the many partners along the river that is restoring habitat for wildlife along the Sacramento River. However, despite these restoration efforts, there are ongoing activities such as water diversion and bank protection that continue to reduce native habitat along the Sacramento River. The proposed project would provide relatively modest increases in environmental benefits when compared to the historic and ongoing loss of native cover types. The SRNWR encompasses only a small portion of the 382-mile long Sacramento River.

The greatest past, present, and foreseeable future impact in the vicinity of the SRNWR is development. There is a clear trend in California of increasing development and associated habitat loss. Additional residential and commercial development may be planned throughout the local area. The SRNWR does not have control over the cumulative negative impacts to native habitats from local development. However, the SRNWR helps to mitigate impacts to native habitats by working with partners to protect important habitats from development and by restoring native habitats within the SRNWR.

Adherence to the policies and regulations pertaining to the protection of cultural resources would avoid any cumulative effects as a result of implementing any of the action alternatives.

- c) **Less than Significant with Mitigation Incorporated.** Most project-related environmental affects have been determined to pose a less than significant impact on humans. Possible impacts from construction emissions (Air Quality) and noise, though temporary in nature, have the potential to result in significant adverse effects on humans. These potentially significant adverse impacts would be reduced to a less than significant level if all minimization measures (Mitigation Measures AQ-1, N-1 and N-2) are fully integrated into the project and construction documents.

4 SUMMARY OF MITIGATION MEASURES

This chapter presents the required mitigation measures for the Codora Habitat Restoration Project, as identified in Chapter 3. Implementation of these mitigation measures would reduce all impacts of the proposed project to a less-than-significant level. The Nature Conservancy (TNC), the U.S. Fish and Wildlife Service (USFWS), and the California Wildlife Conservation Board (WCB) have committed to implementation of all required mitigation measures.

4.1 AIR QUALITY

Mitigation Measure AQ-1: Implement Dust-Control Measures.

With the implementation of the following mitigation measures, short-term construction-generated air quality impacts would be reduced to a less-than-significant level. This mitigation measure would also minimize cumulative impacts on air quality.

Reasonable precautions shall be taken to prevent fugitive dust from leaving the project site, including, but not limited to:

- ▶ land disturbing operations will be suspended when winds exceed 20 miles per hour (mph) to prevent fugitive dust and particulate matter from leaving the project site;
- ▶ dust control measures (e.g., water trucks) will be utilized as necessary to manage dust on the project site;
- ▶ all unpaved road surfaces shall be watered to minimize fugitive dust emissions;
- ▶ all unpaved surfaces, unless otherwise treated with suitable chemicals or oils, shall have posted speed limits of 15 mph;
- ▶ when materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions, or at least six inches of freeboard space from top of the container shall be maintained; and
- ▶ all operations shall minimize the accumulation of mud or dirt on adjacent public streets or expeditiously remove dirt at least once every 24 hours when construction activities are occurring.

4.2 BIOLOGICAL RESOURCES

Mitigation Measure BIO-1: Avoidance of Disturbance to Nesting Raptors and Special-status Birds.

Mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

To avoid nest disturbance and a potential reduction in fledging success resulting from construction activities during the breeding season (February 1 to August 31), focused surveys for raptors and special-status birds shall be conducted by a qualified biologist no more than 14 days prior to the beginning of construction. Surveys for Swainson's hawk nests shall include all areas of suitable nesting habitat within 0.25-mile of the project site. To the extent feasible, guidelines provided in the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in the Central Valley (Swainson's Hawk Technical Advisory Committee 2000) shall be

followed. Surveys for other raptors and special-status birds would include suitable nesting habitat within 500 feet of the project site.

If no active nests are found, no further measures shall be needed. If active nests are found, impacts shall be avoided by the establishment of appropriate buffers and/or nest monitoring by a qualified biologist. The size of the buffer shall be determined by a qualified biologist and may vary, depending on the species biology, location, nest stage, and specific construction activities to be performed while the nest is active. No construction activities shall occur within a buffer zone until a qualified biologist confirms that the nest is no longer active.

Because this mitigation measure would avoid adverse effects to nesting raptors and special-status birds, the proposed project would result in a less-than-significant impact on nesting raptors and special-status birds.

Mitigation Measure BIO-2: Avoidance of Disturbance to Nesting Migratory Birds.

To avoid nest disturbance and a potential reduction in fledging success during any construction activities during the spring and summer breeding season, the project site's walnuts shall be harvested for the last time the previous autumn, and standard orchard maintenance practices (e.g., mowing and herbicide applications) would continue until construction begins to discourage bird nesting in the orchard before felling of the trees. As discussed above for raptors and special-status birds, mowing will be implemented to avoid impacting ground nesting birds. The objective is to identify areas that require mowing as soon as possible and begin mowing them prior to any nest building activities (by March 15). Keeping vegetation mowed prior to and during the nesting period (through July 15) will discourage most, if not all, nesting attempts in these areas. Initial and subsequent mowing should be timed to maintain vegetation height less than 12 inches through the nesting period of March 15 through July 15.

Because orchards would be restored to native habitats anticipated to support a higher diversity and abundance of wildlife species without significantly reducing populations of the species currently on site, the proposed restoration of native riparian habitat would have a long-term beneficial effect on wildlife. Potential impacts to existing wildlife that may occur during construction, maintenance, and visitor use of the proposed riparian habitat and recreational facilities would be expected to be minor. Because the benefits to wildlife of the proposed habitat restoration are expected to be more substantial than any potential construction, maintenance, or visitor use impacts that may occur, the overall effect of the proposed project is considered beneficial to wildlife species, including nesting raptors and migratory birds, and there would not be any substantial adverse effect to special-status species.

4.3 CULTURAL RESOURCES

Mitigation Measure CR-1: If unrecorded cultural resources are encountered during project-related ground-disturbing activities, a qualified cultural resources specialist shall be contacted to assess the potential significance of the find.

If during project-related ground-disturbing activities unusual amounts of shell, animal bone, rock concentrations, dark midden soil, bottle glass, ceramics, structure/building remains, etc. are uncovered or otherwise encountered, ground disturbances in the area of the find will be halted within a 100-foot radius and a qualified cultural resources specialist will be contacted. The archaeologist shall determine whether the resource is potentially significant per the California Register of Historic Resources (CRHR) and develop appropriate mitigation. Appropriate mitigation may include no action, avoidance of the resource, and potential data recovery.

Implementation of Mitigation Measure CR-1 would reduce potentially significant impacts resulting from inadvertent damage or destruction of unknown cultural resources during ground disturbing activities to a less-than-significant level.

Mitigation Measure CR-2: Stop potentially damaging work if human remains are uncovered during project-related ground-disturbing activities, assess the significance of the find, and pursue appropriate management.

California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code Section 7050.5 and Section 7052 and California Public Resources Code Section 5097.

In accordance with the California Health and Safety Code, if human remains are found in any location other than a dedicated cemetery, the California Health and Safety Code requires that excavation is halted in the immediate area. The county coroner shall be notified and is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Section 7050.5[c]).

The responsibilities of the NAHC for acting upon notification of a discovery of Native American human remains are identified within the California Public Resources Code (PRC Section 5097.9). The NAHC is responsible for immediately notifying the person or group it believes is the Most Likely Descendant (MLD). With permission of the legal landowner(s), the MLD may visit the site and make recommendations regarding the treatment and disposition of the human remains and any associated grave goods. This should be conducted within 24 hours of their notification by the NAHC (PRC Section 5097.98[a]). If an agreement for treatment of the remains cannot be resolved satisfactorily, any of the parties may request mediation by the NAHC (PRC Section 5097.94[k]). Should mediation fail, the landowner or the landowner's representative must re-inter the remains and associated items with appropriate dignity on the property in a location not subject to further subsurface disturbance (PRC Section 5097.98[b]).

Through agreement on the treatment and disposition of human remains reached between the MLD and the California Department of Parks and Recreation with the assistance of the archaeologist, or through mediation by the NAHC, implementation of Mitigation Measure CR-2 would reduce potentially significant impacts associated with the discovery of human remains to a less-than-significant level.

4.4 HYDROLOGY AND WATER QUALITY

Mitigation Measure HYDRO-1: Implement Erosion Control and Spill-Prevention Measures.

- ▶ A variety of sediment control measures such as buffers or set backs from the river, silt fences, straw or rice bale barriers, brush or rock filters, sediment traps, fiber rolls, or other similar linear barriers will be placed at the edge of the project area to prevent sediment from flowing off site.
- ▶ The contractor will establish a spill-prevention and countermeasure plan before project construction begins; this plan will include on-site handling criteria to avoid input of contaminants to the waterway. A staging, washing, and storage area will be provided at least 100 feet away from the waterway for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants.
- ▶ No ground disturbing work will occur within the active channel of the Sacramento River.
- ▶ Only state and locally approved herbicides will be used on the restoration site.
- ▶ Herbicide applications will be prescribed by a state-licensed pest control advisor (PCA) and applied by state licensed applicators.

4.5 NOISE

Mitigation Measure N-1: Equip Construction Equipment with Noise Controls and Maintain according to Manufacturers' Specifications.

USFWS shall require construction contractors to ensure that, to the extent feasible, construction equipment shall be properly maintained and equipped with noise controls, such as mufflers, in accordance with manufacturers' specifications.

Mitigation Measure N-2: Limit Construction to Hours Permitted in Applicable Standards.

Construction operations involved with the proposed project shall be limited to the hours of 7 a.m.-7 p.m. Monday through Sunday, during which such activities are exempt from noise levels identified in the applicable standards.

Implementing Mitigation Measures N-1 and N-2 would ensure that noise impacts during construction would be reduced to a less-than-significant level.

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APPENDIX A

Habitat Restoration of the Codora Unit on the Sacramento River National
Wildlife Refuge Draft Environmental Assessment

Habitat Restoration of the Codora Unit on the Sacramento River National Wildlife Refuge

Draft Environmental Assessment

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Appendices

Appendix A. Riparian Habitat Restoration and Management Plan, Codora Unit, Sacramento River (RM 168.5 – 167.5)
Appendix B. Hydraulic Analysis for Riparian Habitat Conservation on the Sacramento River at Beehive Bend (RM 163 to RM 176)

Chapter 1. Purpose of and Need for Action

Introduction

This environmental assessment (EA) evaluates the environmental effects of three alternatives for managing the Codora Unit of the Sacramento River National Wildlife Refuge (Refuge). The U.S. Fish and Wildlife Service (Service) will use this EA to solicit public involvement and to determine whether the implementation of the alternatives would have a significant effect on the quality of the human environment. This is part of the Service's decision-making process in accordance with the National Environmental Policy Act (NEPA), amended and its implementing regulations. This EA addresses only habitat enhancement and restoration activities on the Refuge and is not intended to provide in-depth discussions of related issues of concern, such as public use, which are addressed in the Sacramento River National Wildlife Refuge Final Comprehensive Conservation Plan (June 2005).

Purpose of and Need for the Proposed Action

The Service proposes to implement Alternative B, as described in this EA. The Service proposes to restore riparian habitat including mixed riparian forest, cottonwood riparian forest, valley oak savanna, and grassland on 274.5 acres of the Codora Unit that is currently used for walnut production. Historically, 500,000 acres of riparian forests occupied the Sacramento River floodplain, with valley oak woodland covering the higher river terraces. Since the late 1800s, logging, urbanization, and agricultural conversion have been the primary factors in eliminating riparian habitat. Riparian vegetation along the Sacramento River has been reduced by approximately 90% over that time. The purpose of the proposed action is to restore riparian and associated habitats within the Cordora Unit in a flood neutral manner to help fulfill the Service's congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants.

Project Area

The Refuge is part of the Sacramento National Wildlife Refuge Complex (Complex) and is located in the Sacramento Valley of north-central California (Figure 1). The Valley is bordered by the Sierra Nevada Range to the east and the Coast Range to the west. The Refuge was established in 1989 and is currently composed of 26 units along a 77-mile stretch of the Sacramento River between the cities of Red Bluff and Princeton, 90 miles north of the metropolitan area of Sacramento.

The Codora Unit is located along the western bank of the Sacramento River at river mile 168.5-167.5 (Figure 2). The Unit is in Glenn County west of Butte City

between Colusa and Hamilton City at the intersection of state highways 162 and 45. The site is located in the Beehive Bend subreach (RM 178-164) between the Sul Norte and Packer Lake Units of the Sacramento River NWR.

Figure 1. Sacramento National Wildlife Refuge Complex Map

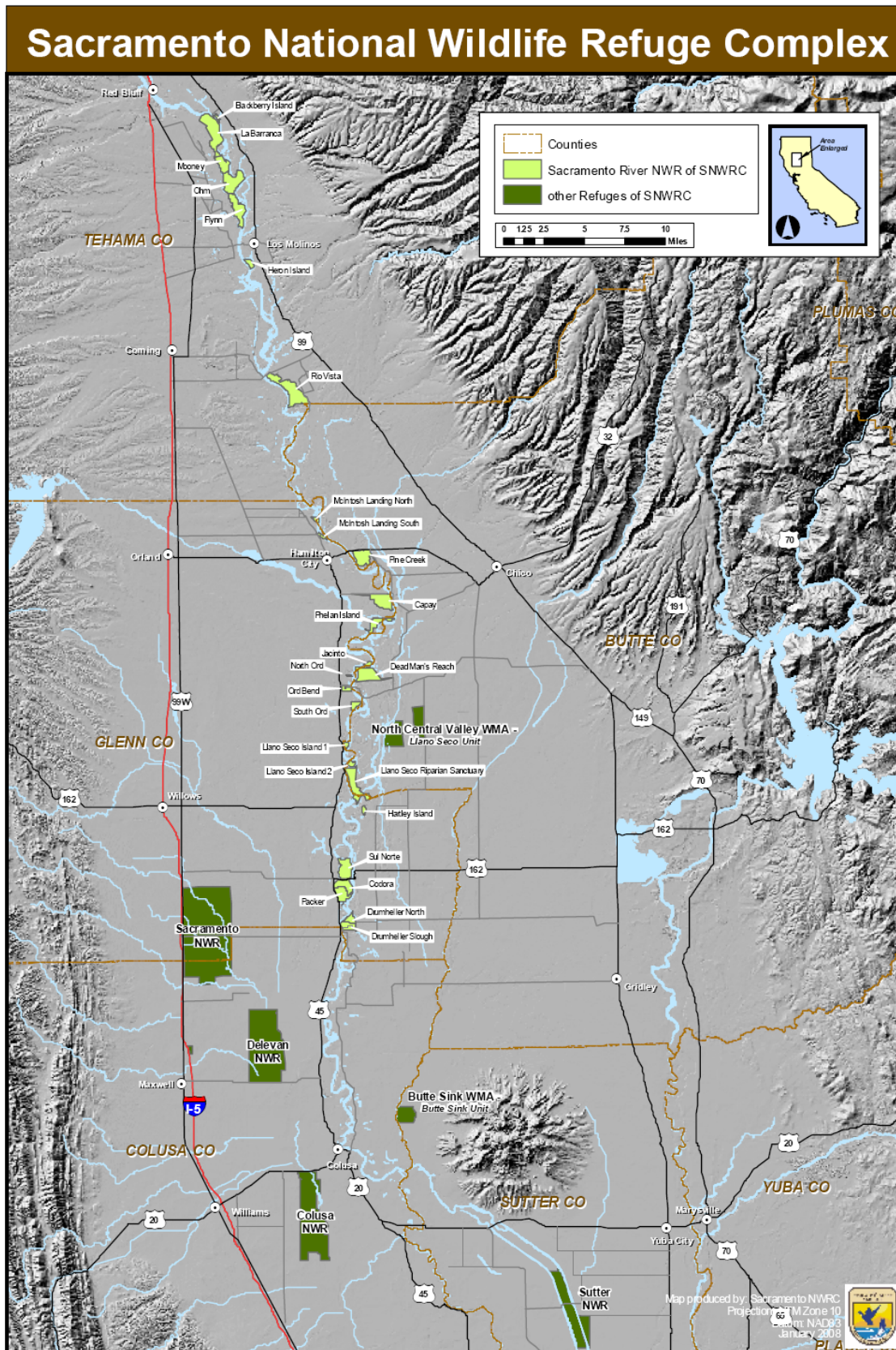
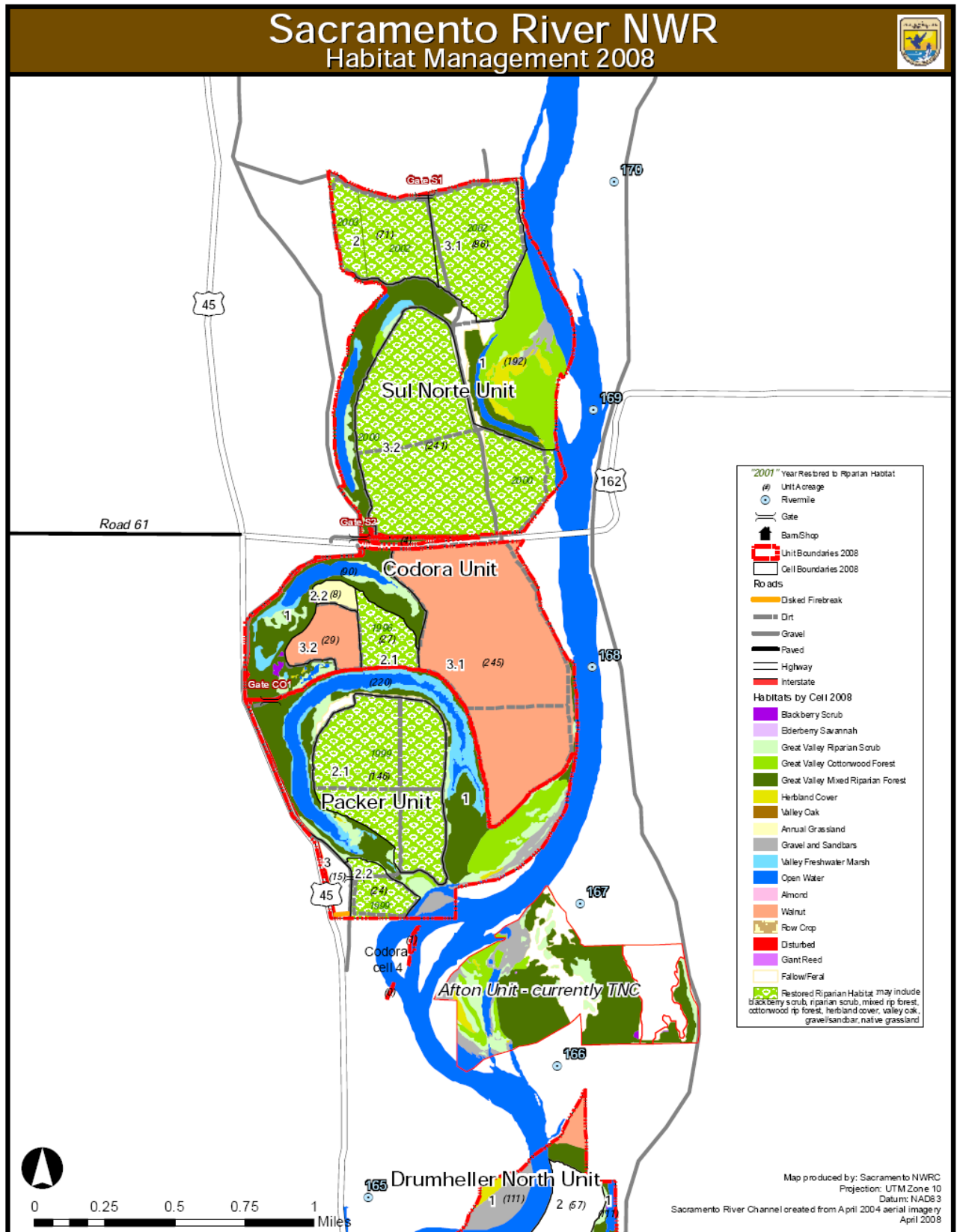


Figure 2. Codora Unit of the Sacramento River National Wildlife Refuge Map



Management of the Codora Unit will be consistent with the Sacramento River National Wildlife Refuge Final Comprehensive Conservation Plan (June 2005). The CCP stated that the Codora Unit will eventually be open to five priority uses (fishing, wildlife observation, photography, interpretation, and environmental education), while remaining closed to hunting (Figure 3). However, these Big Five priority uses will be deferred until agricultural operations have ceased and restoration has been established. The CCP also states that a wildlife viewing/photography blind will be constructed on the Codora Unit when it opens to the public and as funding allows. The Codora Unit will provide a network of hiking trails that will be linked to the parking area, and pedestrian gate on the adjacent Sul Norte Unit. An information kiosk and public use signs will be installed, and interpretive brochures will be provided. There is also potential for coordination/partnering with State Parks in providing visitor services facilities.

Decisions to be Made

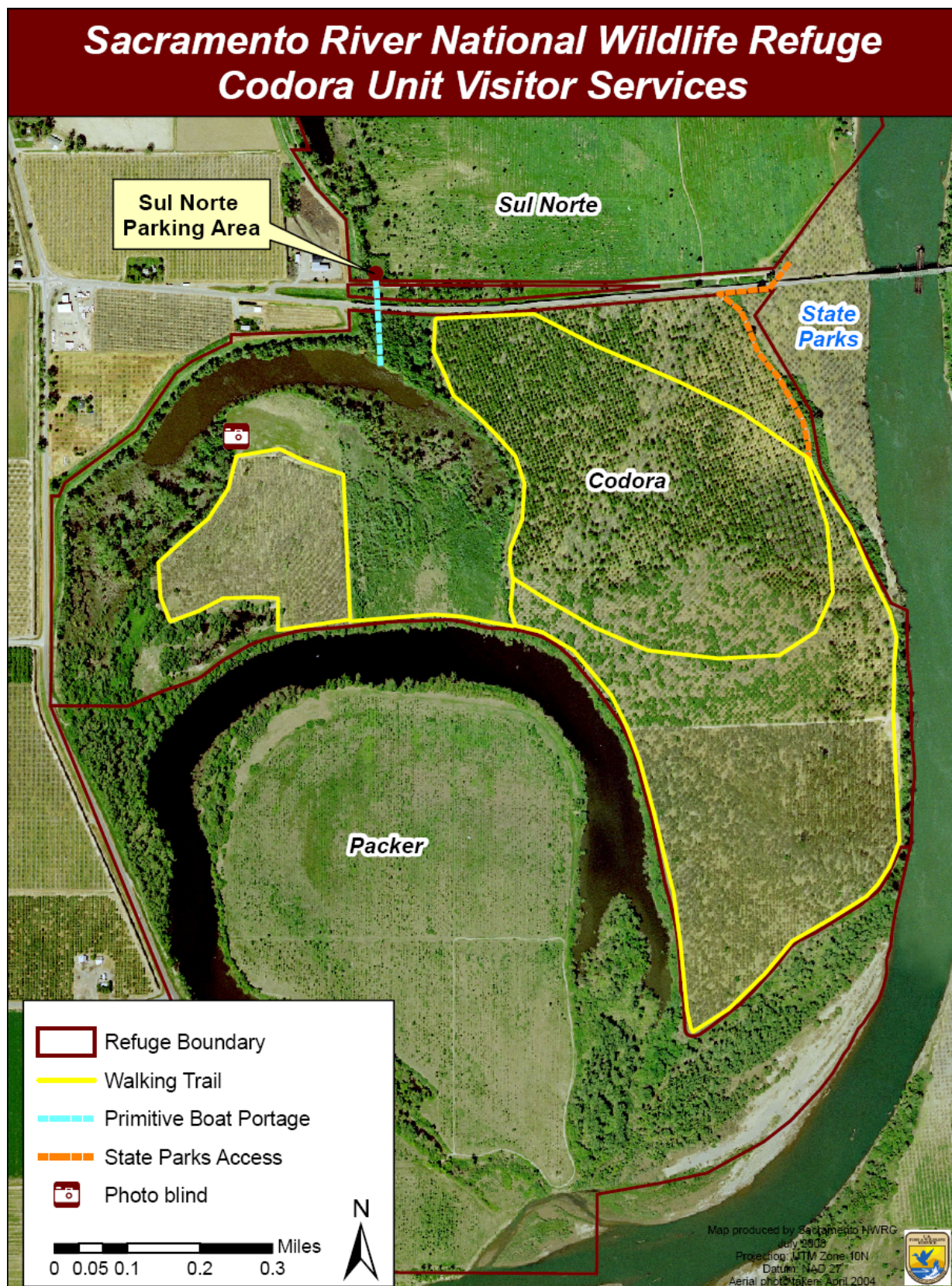
Based on the analysis documented in this EA, the Regional Director must determine the type and extent of management on the Codora Unit of the Sacramento River Refuge and whether the selected management alternative would have a significant effect on the quality of the human environment.

Public Involvement

Interested individuals, organizations, and agencies will have a 30-day comment period to review this draft EA. To facilitate public review this document will be available electronically on the Complex's website <http://sacramentovalleyrefuges.fws.gov> and a hardcopy at Complex's main office in Willows, CA. CD's will also be provided upon request.

Following the 30-day comment period, a final EA will be prepared. Comments received will be incorporated into the final document, as appropriate. Copies of the comments will be available in the "Response to Comments" section of the Final EA. The decision to prepare either a Finding of No Significant Impact or an Environmental Impact Statement will be made after the final EA is completed.

Figure 3. Visitor Service Opportunities on the Codora Unit



U.S. Fish and Wildlife Service and National Wildlife Refuge System

The mission of the Service is working with others to conserve, protect, and enhance the nation's fish and wildlife and their habitats for the continuing benefit of the American people. The Service is the primary Federal agency responsible for migratory birds, endangered plants and animals, certain marine mammals, and anadromous fish. This responsibility to conserve our nation's fish and wildlife resources is shared with other Federal agencies and State and Tribal governments.

As part of this responsibility, the Service manages the National Wildlife Refuge System (Refuge System). The Refuge System is the only nationwide system of Federal lands managed and protected for wildlife and their habitats. The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Sacramento River Refuge is managed as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 as amended by the Improvement Act, and other relevant legislation, executive orders, regulations, and policies.

Refuge Purposes

The Refuge purposes are:

“...to conserve (A) fish or wildlife which are listed as endangered species or threatened species....or (B) plants...” 16 U.S.C. Sec. 1534 (Endangered Species Act of 1973).

"...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..."16 U.S.C. 3901(b) (Emergency Wetlands Resources Act of 1986).

“...for the development, advancement, management, conservation, and protection of fish and wildlife resources...” 16 U.S.C. 742f (a) (4) “...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude...” 16 U.S.C. Sec. 742f (b) (1) (Fish and Wildlife Act of 1956).

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes three alternatives for managing the Codora Unit of Sacramento River Refuge. Alternative A, No Action (Followed by Orchard Removal and Natural Recruitment), Alternative B, Savanna-dominant Habitat Restoration (Proposed Action), and Alternative C, Full Mixed Riparian Habitat Restoration.

All alternatives considered in this EA were developed with the mission of the Refuge System and the purposes of the Refuge as guiding principles. Under the No Action alternative, the Service would continue managing the Codora Unit as it is currently managed. Two of the three alternatives presented in this chapter are “action alternatives” that would involve a change in the current management of the Refuge. The Service’s proposed action is Alternative B.

Alternative A: No Action, Orchard Removal and Natural Recruitment

Under this alternative, the Service would continue to manage the Sacramento River Refuge as it has in the recent past, in accordance with the CCP. The Codora Unit consists of a 274.5-acre walnut orchard that is surrounded by 126 acres of existing remnant habitat, primarily cottonwood riparian forest and valley oak forest in composition (Figure 2). The 274.5 acres would continue to be farmed until the orchard is no longer productive. The orchard would then be removed to prevent walnut pests from infesting an abandoned orchard, thus preventing spread to neighboring orchards. No weed control or riparian restoration activities would occur on the Codora Unit under Alternative A. Currently, non-native species established on the Refuge threaten its biological integrity as well as the biological integrity of downstream Refuge and non-Refuge lands.

This alternative would rely on natural recruitment to provide habitat. Agricultural operations would eventually cease under this alternative, but planting of native species would not occur. Natural recruitment would be expected to modify the vegetation patterns on the Codora Unit over time. Due to the fragmented nature of remnant vegetation, this could take decades and long-term benefits would be delayed.

While this alternative is technically feasible, it is inconsistent with the intent of Congress in authorizing development of an 18,000-acre Refuge along the Sacramento River. It would result in substantially fewer positive impacts on wildlife along the river than Alternatives B and C. This alternative would provide no short-term and little long-term benefit to wildlife and fishery resources, and recruitment would likely promote colonization of the project area by non-native species that have lower value for target wildlife species. This option could also have negative impacts on adjacent riparian habitat by facilitating the spread of non-native species to other areas. Although the No Action alternative would not meet

the project purpose or need, and would not conform to the Service's congressional mandate to preserve, restore, and enhance natural habitats for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident wildlife, and plants on the Refuge System, it is included in the analysis as a benchmark comparison to the action alternatives.

Alternative B: Habitat Restoration; Savanna Dominant (*Proposed Action*)

Under this alternative, the Refuge would restore 208 acres of valley oak savanna, 28.5 acres of mixed riparian forest, 30 acres of cottonwood riparian forest, and 8 acres of grassland on the Codora Unit (Figure 4). A Riparian Habitat Restoration Plan was developed by TNC (2008) (Appendix A). The plan describes a specific restoration design based on the environmental conditions and ecological goals on the Codora Unit. Ecological goals include establishing riparian floodplain habitats for endangered and threatened species, migratory water birds and landbirds, and anadromous fish. A variety of plant communities (vegetation type) are used because various trees, shrubs, vines, and herbaceous plants are adapted to the different physical site conditions. Important site conditions include, soil texture and chemistry, depth to the water table, depth the refusal (i.e., gravel) where root penetration is not possible due to lack of water, and flood frequency. Planting appropriate species according to these ecological conditions results in sites within the restoration of various species composition, various frequencies of the selected plant species, and various planting densities: all of these variables combine to define the type of vegetation, or plant community. In addition to ecological goals, social or cultural goals are implemented which results in the use of specific plant communities. For example, maintaining conveyance for flood waters sometimes necessitates the use of flexible shrub/vine/herbaceous and savanna vegetation. The procedures for implementation of orchard removal, site preparation, planting/seeding, maintenance, and monitoring are also described in this plan (Appendix A). This restoration plan is consistent with the Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge (USFWS 2002), the Final Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge (USFWS 2005), and the results of the Beehive Bend Hydraulic Modeling report (Ayers Associates 2005, Appendix B). The communities planned for habitat restoration are based on site assessments of the soil profile, topography, flood frequency and hydraulic modeling, depth to groundwater at base flows, weed community, and existing riparian community.

Ecological objectives for this alternative include:

- To establish early and late successional stage riparian communities which have been severely reduced in extent along the Sacramento River since 1850.
- To provide habitat for neo-tropical migrant land birds.
- To provide habitat for the elderberry longhorn beetle.
- Improve water quality by decreasing sediment and pesticide runoff into the Sacramento River.

This alternative was developed taking into consideration the flood control features of the Sacramento River. An iterative design approach was used in a joint effort of TNC ecologists and Ayers Associates engineers. This design incorporates more savanna cover to reduce locations of increased water surface elevation, and it achieves flood neutrality with every water surface elevation either slightly reducing or remaining the same. According to the California Department of Water Resources, the Codora Unit floods every 1 to 5 years with the 274.5-acre restoration area in the 4-year estimated flood frequency interval. The 208 acres of valley oak savanna habitat will serve as an essential flood corridor due to its low tree density. The appropriate land covers were designed based on the existing vegetation, soil types and availability of groundwater so that no higher hydraulic friction would naturally occur. Restoring the 208 orchard plot to savanna would decrease Manning's Roughness Coefficient from 0.100 for orchards to 0.040 for savanna (Ayers Associates 2005).

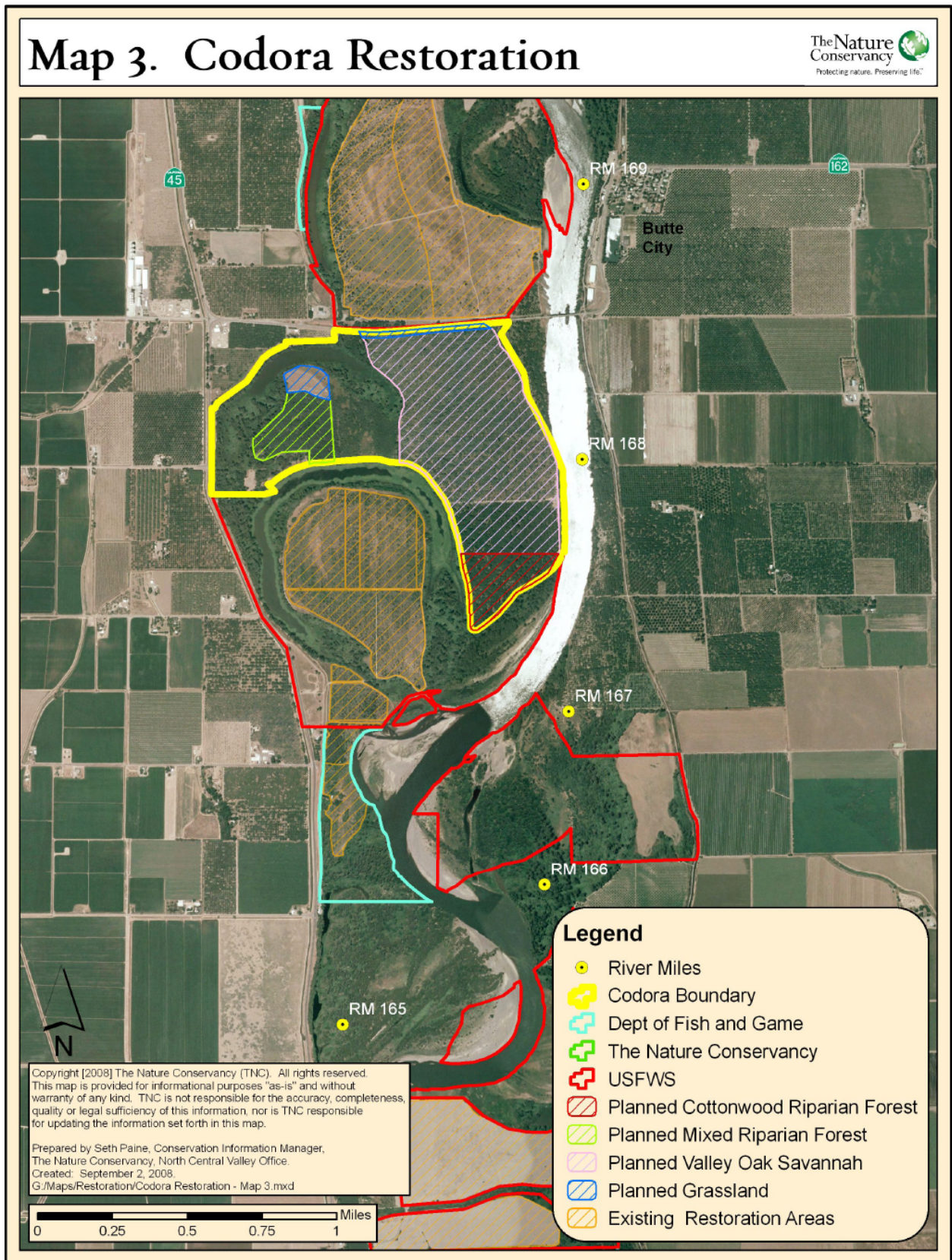
The 274.5-acre Codora Unit restoration will improve the ecological health and long-term viability of at-risk species and riparian communities along the Sacramento River by restoring riparian habitat and improving water quality through active restoration. Restoration on this site facilitates the establishment of native riparian habitat that without active cultivated restoration would return to native vegetation at a very slow rate or not return at all. Restoring riparian habitat in the area will improve habitat for fish and wildlife by creating a large continuous block of habitat. Fish benefit from riparian areas that become flooded at high flows, where floodwaters are relatively slower and warmer than the main channel and provide refugia for young and juvenile fish. Additionally, large woody debris, a result of increased riparian habitat, provides food and cover for critical life stages of anadromous fish. Additionally, restored riparian forests will buffer and filter toxic and organic matter that originate further away from the river, thereby further enhancing water and sediment quality.

The restoration site will provide quality habitat for the VELB in 208 acres of Valley Oak Savanna (Figure 4). Plant communities with low woody species densities (i.e., savannas) containing blue elderberry bushes provide long-term high quality VELB habitat because the bushes thrive in open canopy vegetation. Existing riparian habitat at the restoration site may provide source VELB populations for restoration site colonization.

The Refuge in partnership with conservation groups and other government agencies has planted about 118,000 elderberry shrubs in restoration projects along the Refuge over the past 15 years. Recent research investigations have documented successful Valley Elderberry Longhorn Beetle (VELB) colonization at these restoration sites (River Partners 2004; Gilbert et al. 2008). The CCP for the Sacramento River Refuge (USFWS 2005) identifies the need to work with Federal,

State, county, levee and irrigation districts to investigate best management practices for habitat, water diversion, and flood management projects through technical studies and agency coordination. Accordingly, the Refuge has implemented a self-imposed, 100-foot valley elderberry shrub-free zone (Appendix A, Environmental Assessment, Mitigation Measures) intended to buffer the boundaries between Refuge restoration sites and private orchards, levees, and roadways so that agricultural pesticide drift from those neighboring private orchards and facility and levee maintenance operations will not affect VELB habitat in restoration sites or adjacent landowner operations. The Refuge has coordinated and worked with the local levee districts to maintain 20-30 foot vegetation free areas where appropriate along the borders with private lands and adjacent to the U.S. Army Corps of Engineer (ACOE) levees. Construction and maintenance of vegetation firebreaks on all Refuge property bordering ACOE is incorporated as “high” priority projects described in the Annual Habitat Management Plans for the Sacramento River Refuge. No woody species or elderberries would be planted within 100 feet of the Butte City Causeway to allow for vegetation control adjacent to the CalTrans Bridge structure.

Figure 4. Codora Unit Restoration Map



Alternative C: Habitat Restoration; Full Mixed Riparian Forest
(Alternative Considered but Eliminated from Detailed Analysis)

Under this alternative, the Refuge would restore 274.5 acres of mixed riparian forest on the Codora Unit. Unlike Alternative B, valley oak savanna, cottonwood riparian forest, and grassland would not be included in the restoration. This alternative is consistent with the Final Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge (USFWS 2005).

Ecological objectives for this alternative include:

- Establish early and late successional stage riparian communities, which have been severely reduced along the Sacramento River.
- Provide habitat for neo-tropical migratory birds.
- Improve water quality by decreasing sediment and pesticide runoff in to the Sacramento River.

Mixed riparian forest typically occurs in association with watercourses within the Great Central Valley of California and is a CNDDDB-listed sensitive plant community (CDFG 2003). Common tree and shrub species include Oregon ash, Fremont's cottonwood, valley oak, Himalayan blackberry, arroyo willow, blue elderberry, poison-oak, California rose, and California wild grape. Herbaceous plant species include Santa Barbara sedge and mugwort.

Riparian forests provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for a diversity of wildlife species. According to Mayer and Laudenslayer (1988), at least 50 amphibian and reptile species are known to occur in lowland riparian systems, and approximately 55 species of mammals are known to use Central Valley riparian communities. Due to the dense canopy and understory of the riparian forest habitat type, a large variety of neo-tropical migrant bird species use this habitat, including yellow-billed cuckoo (*Coccyzus americanus*), Audobon's warbler (*Dendroica coronata*), black-headed grosbeak (*Pheucticus melanocephalus*), black-chinned hummingbird (*Archilochus alexandri*), Anna's hummingbird (*Calypte anna*), downy woodpecker, Nuttall's woodpecker, and spotted towhee (USFWS 2005).

This alternative is consistent with the Refuge's restoration goals, as well as the intent of Congress in authorizing development of an 18,000-acre Refuge along the Sacramento River. In addition to meeting the project purpose, this option supports the Service's congressional mandate to preserve, restore, and enhance natural habitats for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident wildlife, and plants on the Refuge System. This option would have the highest benefit for wildlife and fisheries resources.

Although this alternative is consistent with the Refuge's restoration goals, it is not

supported by the hydraulic modeling conducted for the Beehive Bend reach of the Sacramento River. A hydraulic model was designed to represent a maximum vegetation conservation and restoration configuration that would not exceed maximum freeboard requirements (Ayers Associates 2005). This model incorporated more riparian forest, while maintaining some savanna habitat. The water surface elevations increased in several areas as a result of the model. These increases were not acceptable by the Central Valley Flood Protection Board guidelines, which mandated that the project be flood neutral (no increase in water surface over existing conditions, regardless of freeboard).

Chapter 3. Affected Environment

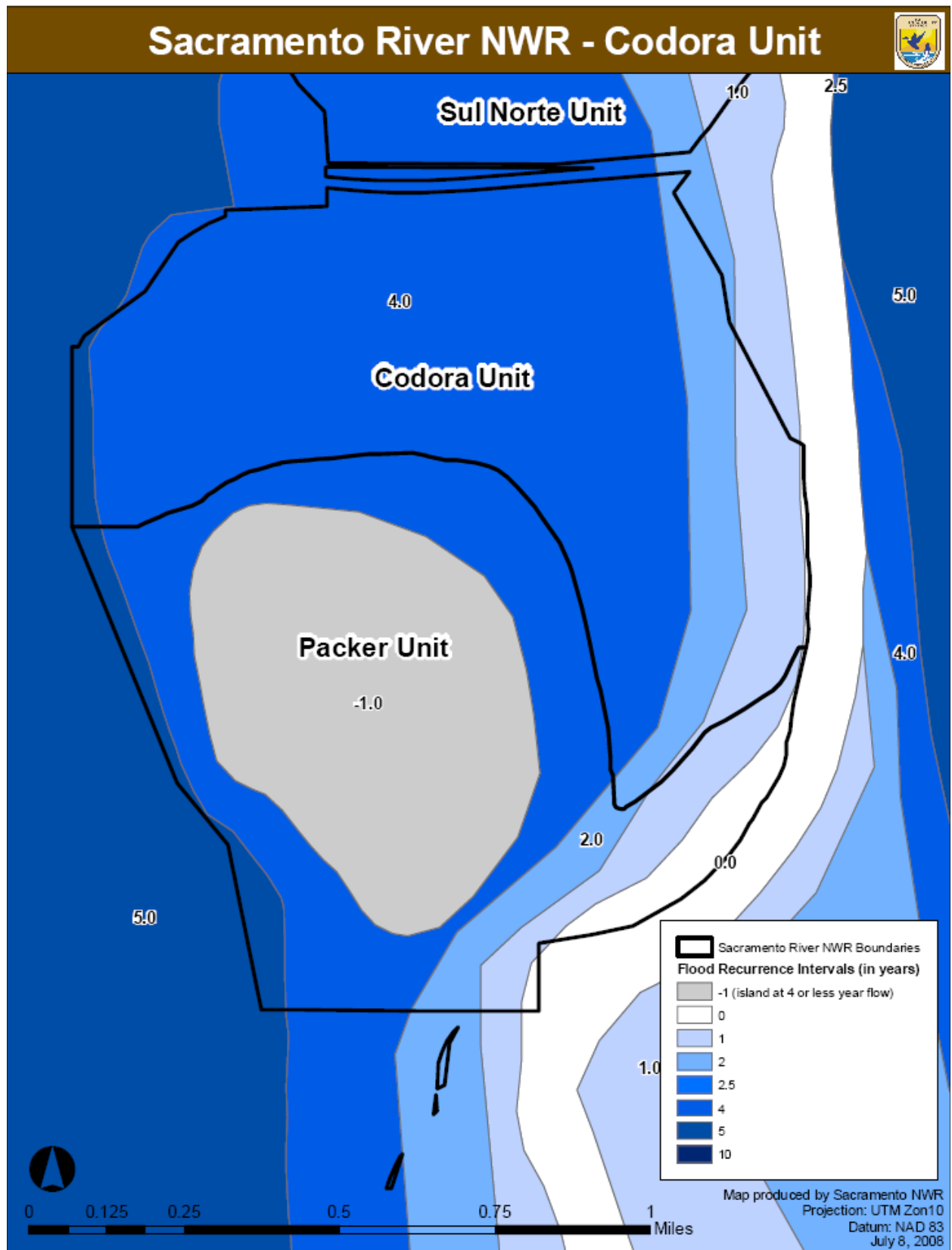
Physical Environment

Geology, Hydrology, and Soils

The area of the Refuge between Red Bluff and Chico Landing is underlain by sedimentary and volcanic deposits associated with the Tehama, Tuscan, and Red Bluff formations (Harwood and Helley 1982; Helley and Harwood 1985). On top of these formations lie terrace deposits, such as Riverbank and Modesto formations, as well as paleochannel deposits, alluvial fans, meanderbelt deposits, and basin and marsh deposits (Department of Water Resources 1994; Robertson 1987). The Modesto and Riverbank deposits flank the river in steps away from the channel and tend to erode at lower rates than other young deposits. These areas tend to form higher, more consolidated banks, and have a high proportion of Class I agricultural soils, including the Columbia and Vina loams. The Codora Unit consists of Columbia silt loam, 0-2 percent slopes (Begg 1968). The soils on the western portion of the Codora Unit exist within old channels (oxbow lakes) of the Sacramento River (Columbia silt loam, water table, 1-8 percent slopes). In that region the water table is permanently high (typically even with the Sacramento River) and the soils have poor drainage (Begg 1968).

There are many tributaries that enter the Sacramento River through Refuge properties located north of Chico, including Coyote Creek, Oat Creek, Elder Creek and Hoag Slough. Although this area has a large number of tributaries, the overall hydrology has been greatly changed due to the presence of Shasta Dam. Bank erosion rates have declined, likely due to reduction in frequency of overbank flows and increased bank protection. From Red Bluff to Colusa, the Sacramento River is characterized by three general levels of bank protection; however, the U.S. Army Corps of Engineers and California Department of Water Resources rip-rap isolated stretches throughout this area. First, from Red Bluff to Ord Bend, bank protection consists of small private levees discontinuously protecting individual private properties. The Corps of Engineers Sacramento River Bank Protection Program levee system begins at the left bank at Ord Bend and at the right bank about seven miles below. Second, from this point downstream, the Corps of Engineers project levees are continuous. In the leveed portion of the Beehive Bend subreach, there are no significant tributaries entering the Sacramento River. Third, the levees constrict just below Princeton, greatly reducing the formation of point bars and floodplain, which in turn affect the regeneration of cottonwood and willow forests. The Codora Unit floods every 1 to 5 years with the 274.5-acre orchard in the 4-year estimated flood frequency interval (California Department of Water Resources).

Figure 5. Estimated Flood Recurrence Intervals



Contaminants and Water Quality

The Refuge lies within the jurisdiction of the Central Valley Regional Water Quality Control Board, which established beneficial uses and water quality objectives for surface water and groundwater in the Water Quality Control Plan (Basin Plan) for the region. Because the Sacramento River originates as snowmelt, it is of excellent water quality; therefore, it supports all existing beneficial uses of the Basin Plan, including domestic, agricultural, and industrial water supply; recreation; wildlife habitat; cold and warm freshwater fish habitat; and migration and spawning for salmonid fisheries. The water is considered soft, moderately alkaline, and low in dissolved solids, with high turbidity during peak runoff periods. The Sacramento River is listed as impaired on the U.S. Environmental Protection Agency's (EPA) Section 303 (d) list of water bodies for the pesticide diazinon, and trace metals (including mercury, cadmium, copper, and zinc).

A Level I Contaminants survey was conducted by the Service and found no contaminants on the Codora Unit. However, the walnut orchard on the Codora Unit does have problems with surface drainage of fertilizers and pesticides into the River. This includes Manex, a heavy metal and carcinogen. The unit is subject to poor irrigation methods, including flood irrigation over the two large southeastern blocks of the orchard with no buffer. Other pesticides used at Codora include Copper Hydroxide, Confirm, Intrepid, GF-120, Apollo, and Glyphosate. Malathion is no longer used due to its high level of environmental risk. The effects of both Manex and Copper Hydroxide are of concern to fish, especially sub lethal behavioral modifications.

Air Quality

The Codora Unit lies within the Sacramento Valley Air Basin (SVAB) and is under the jurisdiction of the Glenn County Air Pollution Control District (GCAPCD). The SVAB is bounded on the north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada Mountains. These mountain ranges provide a substantial physical barrier to locally created pollution, as well as that transported northward on prevailing winds from the Sacramento Metropolitan area. The valley is often subjected to inversion layers that, coupled with geographic barriers and high summer temperatures, create a high potential for air pollution problems.

The state is divided into Air Pollution Control Districts and Air Quality Management Districts. These agencies are county or regional governing authorities that have primary responsibility for controlling air pollution from stationary sources. The GCAPCD establishes policies, regulations, and permit procedures and monitors air quality parameters within Glenn County.

Biological Environment

Vegetation

The Sacramento River Refuge currently consists of 10,818 acres of agricultural and riparian floodplain habitats. Agricultural areas include walnut orchards, pasture, and row crops; currently, accounting for 16 percent of Refuge lands. Riparian habitats include open river channel water, off-channel oxbow wetlands, gravel and sand bars, herbland cover, blackberry scrub, Great Valley riparian scrub, Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Valley oak, Valley freshwater marsh, perennial and annual grasslands, giant reed, disturbed, and restored riparian. Appendix G of the CCP (USFWS 2005) contains a complete list of plant species that occur and potentially occur on the Refuge.

Currently, walnut orchards dominate the Codora Unit (Figure 2). The unit contains a 274.5 acre walnut orchard that is surrounded by 126 acres of existing remnant habitat. Walnut orchards in the project area are a monoculture of English walnut (*Juglans regia*). Ongoing agricultural activities prevent herbaceous vegetation from forming an understory underneath the walnut tree overstory. The remnant habitat is primarily cottonwood riparian forest and valley oak forest in composition. The vegetation profile includes the natural regeneration of 28 acres of arroyo willow, cottonwood, and box elder, which germinated in 1996, after last being row cropped in 1995. The site also contains annual rye grass, Johnsongrass, morning glory, chick weed, and other problematic weeds that can inhibit native plant growth if unchecked.

The current 28 restored riparian acres were allowed to undergo natural recruitment in 1996, and received no irrigation or chemical/physical treatments. Natural recruitment was successful for these 28 acres because the site elevation is lower than the surrounding floodplain and retains water and soil moisture longer. Following the final crop harvest, the site was tilled and ridged with irrigation furrows. Overbank flows caused this site to flood and pond water during the willow and cottonwood seed set and dispersal. Seeds landed on the wet furrows and the roots developed, grew and followed the soil moisture gradient as it fell during soil dry down. With the roots growing downward and keeping pace with soil drying, they eventually tapped into the water table and the trees became established. These conditions are typical of sandbar willow and cottonwood natural recruitment, where the seedlings are closer to the water table on the relatively low sandbars (river elevations are roughly equivalent to water table). These conditions are rare on the floodplain and usually only occur in low lying and/or relatively deep off-channel swales. Thus, cultivated restoration practices are necessary for successful floodplain restoration.

Wildlife Resources

Riparian and floodplain habitats at the Refuge provide water, food, cover and shelter to a variety of wildlife, which breed and/or winter here. These include migratory gulls and terns, herons and egrets, ducks and geese, shorebirds, hawks, eagles and turkey vultures, and variety of songbirds and other landbirds such as swallows and woodpeckers, California quail and wild turkey. The Refuge also provides habitat for various bats, rabbits/hares, squirrels, raccoon, ringtail cat, skunk, river otter, black-tailed deer, coyote, bobcat, mountain lion, lizards, skink, western pond turtle, snakes, frogs and various aquatic and terrestrial insects, including beetles, bees, flies, butterflies, moths, dragon and damsel flies, and spiders. Appendix G of the CCP (USFWS 2005) contains a complete list of wildlife species that occur and potentially occur on the Sacramento River Refuge.

The food, water, and shade that agricultural crops offer attract a limited amount of wildlife species. Mourning dove, western bluebird, scrub-jay, red shafted-flicker, lazuli bunting, European starling, and house finch are known to nest in orchards. Black-tailed hare, California vole, and pocket gopher are also present in orchards. Deer and rabbits browse on trees; squirrels and various birds feed on nuts. Species that have been reported to feed on nut crops include northern flicker, scrub jay (*Aphelocoma coerulescens*), American crow (*Corvus brachyrhynchos*), plain titmouse (*Parus inornatus*), Brewer's blackbird (*Euphagus cyanocephalus*), house finch (*Carpodacus mexicanus*), and California ground squirrel (*Spermophilus beecheyi*) (Mayer and Laudenslayer 1988)

Fisheries Resources

The Sacramento River provides important habitat for a diverse assemblage of fishes, including both anadromous and resident species. Anadromous fish include Chinook salmon (four runs), steelhead, striped bass, American shad, green and white sturgeon, and pacific lamprey. Resident fish can be separated into warmwater game fish (such as largemouth bass, white and black crappie, channel catfish, white catfish, brown bullhead, bluegill, and green sunfish), coldwater game fish (including rainbow trout and brown trout), and nongame fish (such as Sacramento squawfish, Sacramento splittail, Sacramento sucker, and golden shiner). Appendix G of the CCP (USFWS 2005) contains a complete list of fish species that occur and potentially occur on the Sacramento River Refuge.

Sensitive Species

The Sacramento River Refuge provides breeding, rearing, migratory staging, and wintering habitat for Federal and State threatened and endangered species and species of special status. Species include federally listed endangered Chinook salmon (winter-run ESU); federally listed threatened Chinook salmon (spring-run ESU), Central Valley steelhead, North American Green Sturgeon Southern DSP, Valley elderberry longhorn beetle (VELB); and federal candidate western yellow-billed cuckoo and Chinook salmon (fall- and late-fall run ESU). Appendix G of the

CCP (USFWS 2005) contains a complete list of sensitive species that occur and potentially occur on the Sacramento River Refuge.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*, or VELB) is listed as threatened under the Federal Endangered Species Act (ESA). VELB spends its entire life cycle on blue elderberry (*Sambucus mexicana*), which provides reproductive habitat and food for the species. As such, elderberry shrubs are legally protected because they are the host plant for VELB. Elderberry shrubs occur in mixed riparian forests and savannas. Elderberry shrubs are present in riparian areas near the restoration sites but are not common in agricultural or orchard habitats where routine agricultural practices prevent the germination or growth of seedlings.

The existing riparian vegetation and proposed areas of restored riparian vegetation do and will support several species of migratory birds. Some of these species, including yellow-billed cuckoo, require mature riparian vegetation composed of willow and cottonwood. This habitat type will support other special-status species (such as willow flycatcher) during migration and will provide nesting habitat for many other bird species. In the Central Valley, Swainson's hawk nest sites are strongly associated with riparian forest and savanna vegetation near open agriculture such as cereal grains and irrigated pasture; the primary habitat requisite provided by riparian systems is nesting substrate, typically large trees (Riparian Habitat Joint Venture 2004). In Central California, about 85% of Swainson's hawk nests are within riparian forest or remnant riparian trees, with nearby treeless agricultural lands used for foraging (RHJV 2004). Swainson's hawks have been observed perched in valley oak trees and flying in broad circles along the Sacramento River between Red Bluff to Colusa. While they are not known to nest in the project area, they are known to nest in the vicinity of other Refuge units, such as the neighboring Sul Norte Unit.

Annual erosion of mid and high floodplain elevation banks of Columbia silty-loam and Columbia sandy-loam is necessary for bank swallow colony establishment. The largest populations occur along the middle Sacramento River, from Red Bluff to Colusa, and survey results have shown the importance of the Sacramento River Refuge to the bank swallow, a California State Threatened species. The majority of the eastern boundary of the Codora Unit consists of an eroding steep cut bank, which could potentially be colonized by bank swallows in the future. A bank swallow colony was located at the north end of the Codora Unit in June 2008 on adjacent State Parks land.

Social and Economic Environment

Employment

California has a \$1.4 trillion gross state product, which makes it the largest state economy in the nation and the fifth largest economy in the world (California Department of Transportation 2005). The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that the state has 14.9 million wage and salary jobs. In 2004, 139,500 jobs were created, 97 percent of which came from the non-farm sector. The unemployment rate declined to 6.2 percent. The per capita income in California is \$34,220 and the average salary per worker is \$49,690. Employment growth is expected to increase over the next several years.

The unemployment rate is one of the best ways to measure the economic health of a region. The Great Valley Center's report on "Assessing the Region Via Indicators: The Economy" (2005), states that while unemployment in the Central Valley remains substantially higher than the rest of California, the difference has decreased slightly since 1998. From 1994-1998, the Central Valley's unemployment rate averaged 11.9 percent, which was 4.8 percentage points higher than the State rate. From 1999-2003, the Central Valley unemployment averaged 10 percent, which was 4.2 percentage points higher than the State rate.

Agriculture is a critical part of the economy in Glenn County. In 2004, agriculture was responsible for 20 percent of total employment, and total crop production was valued at over \$327 million (California Department of Transportation 2005). State/local government is the largest employment sector and agriculture is the second (employing 1,520 people) (California Department of Finance 2002). The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that Glenn County had 7,580 wage and salary jobs increasing 5.1 percent (369 jobs) from the previous year. Non-farm employment added 142 jobs, while farm employment added 227 jobs. The unemployment rate, declined to 9.4 percent in 2004. Employment growth is expected to increase over the next several years, as a result of growth in the non-farm sector.

Butte County's agriculture industry is a vital factor in the county's economic success. The County has ideal conditions for agricultural production, supporting a variety of crops including rice, almonds, walnuts, prunes, peaches, and kiwi fruit. Farm and farm related services in Butte County have been estimated to value between \$250 million and \$350 million annually for the last several years (California Department of Transportation 2002). The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that Butte County had 74,240 wage and salary jobs decreasing 1.4 percent (1,050 jobs) from the previous year. Non-farm employment lost 1,058 jobs (1.5 percent decline), and the unemployment rate fell to 7.2 percent in 2004. Employment growth is

expected to increase over the next several years.

Colusa County is the most productive rice growing county in the nation (New Valley Connexions 2001). Agriculture is the largest employment sector (employing about 2,540 people) and State/local government is second (California Department of Finance 2002). In the 2005-2025, County-Level Economic Forecast (California Department of Transportation 2005), Colusa County had 7,480 wage and salary jobs increasing 1 percent (77 jobs) from the previous year. Non-farm employment added 42 jobs, while farm employment added 35 jobs. The unemployment rate declined to 13.6 percent in 2004. Employment growth is expected to increase over the next several years.

Tehama County is a large recreational and agricultural region that includes vast areas of open space for cattle, ranches, orchards, row crops, and both large and small farms (California Department of Transportation 2002). The largest sectors in Tehama County are government, education and healthcare services, retail trade, and manufacturing. The principal sectors that are producing jobs in Tehama County are wholesale trade, retail trade, construction, and farm. The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that Tehama County had 17,220 wage and salary jobs decreasing 1.9 percent from the previous year. Non-farm employment lost 377 jobs, however, the unemployment rate, fell to 7.3 percent in 2004. Employment growth is expected to increase over the next several years, as a result of growth in the non-farm sector.

The Codora Unit, located in Glenn County, was acquired in 1994. The unit's 274.5 acres of walnut acres are managed under a Cooperative Land Management Agreement (CLMA) with TNC and leased to a tenant farmer. However, no trees have been replanted in the last ten years, and the orchard is losing productivity. The naturally restored 28 acres of riparian forest were last row cropped in 1996.

Local Economy

Agriculture is the dominant economic enterprise in the northern Sacramento Valley. The diversity of crops grown in the Sacramento Valley reflects the diversity of soils, climate, cultural and economic factors. Butte County's major crops include rice, almonds, prunes, and walnuts; Glenn County's include rice, almonds, prunes, alfalfa, and corn; Tehama County's include prunes, walnuts, olives, and pasture; and Colusa County's include rice, tomatoes, and almonds. Areas in proximity to the river mainly support tree crops. Countywide agricultural production values for 2005 are \$432.0 million for Butte; \$393.7 million for Glenn; \$147.6 million for Tehama; and \$392.7 million for Colusa (California Department of Finance 2007).

The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that Butte County's per capita income is \$24,620, and the average salary per worker is \$31,540. The estimated median family income

in Butte County in 2005 was \$48,200. Glenn County's per capita income is \$21,210, and the average salary per worker is \$30,780. Colusa County's per capita income is \$27,690, and the average salary per worker is \$31,450. The estimated median family income in Colusa County in 2005 was \$47,650. Tehama County's per capita income is \$20,890, and the average salary per worker is \$32,050. The estimated median family income in Tehama County in 2005 was \$43,700.

Although the lands included within the Refuges are federally owned and therefore provide no property taxes, several factors help to mitigate this loss of revenue to local governments. First, Refuge lands and waters demand little in the way of expensive infrastructure or services. Second, when the Service acquires private land in fee, Congress allocates payments to counties under the Refuge Revenue Sharing Act to partially compensate for the loss of property taxes. In addition, the designation of this property as a refuge and the resources protected within the refuge contribute to the local economy by drawing visitors from outside the county to the area for wildlife viewing, hunting, environmental interpretation, and other ecotourism related activities. While visiting the Refuges, visitors contribute by purchasing goods and services from local businesses. In addition, they contribute additional sales taxes to local governments, as well as transit occupancy taxes that are used by local governments to fund a variety of services.

The report "Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation" (USFWS 2007b) detailed the findings from 80 national wildlife refuges, including Sacramento Refuge. The Banking on Nature 2006 study included money spent for food and refreshments, lodging at motels, cabins, lodges or campgrounds, and transportation when it calculated the total economic activity related to refuge recreational use.

Sacramento Refuge had over 137,430 visits in 2006. Refuge visitors enjoyed a variety of activities, including wildlife viewing, hiking, and migratory bird hunting. Non-residents accounted for about 127,408 or 93 percent of recreation visits and almost all of the visits were for non-consumptive recreations (129,257). Sacramento Refuge generated an estimated \$2.4 million in total economic activity related to refuge recreational use with associated employment of 25 jobs, \$773,500 in employment income and \$391,100 in total tax revenue. Total expenditures were \$1.8 million with non-residents accounting for 1.7 million or 96 percent of total expenditures. Expenditures on hunting accounted for 57 percent of all expenditures, and non-consumptive activities accounted for 43 percent. Sacramento Refuge generated \$2.78 of recreation-related benefits for every \$1 of budget expenditure during 2006.

The Codora Unit's 274.5 acres of walnut acres are currently managed under a CLMA with TNC and leased to a tenant farmer. The orchard is losing productivity, and no trees have been replanted for the last ten years. Between 2003 and 2007,

crop yield has dropped from 943,000 lbs. to 682,875 lbs. The orchard is now at about 65 percent of its original productivity, especially due to sick and lost trees. Walnut prices are currently strong and are keeping the orchard economically productive. However, walnut prices are not stable, and the orchard will continue to lose viability in the coming years. The majority of the orchard consists of Ashley walnuts, which are considered a poor variety due to cracking at harvest. The western orchard has been so marginally productive that abandonment was considered several years ago.

There are several other management problems with the Codora orchard. Ground squirrels have overrun about 80 percent of the orchard and have left holes up to two feet in diameter. Without the use of poisons, control methods have been ineffective. Surface drainage of fertilizers and pesticides into the River is also an issue. During flood events, silt and some debris can also be deposited, but the Sul Norte restoration north of the Codora Unit helps to trap some of this material.

Land Use and Zoning

The Refuge is bordered by private lands, as well as Federal and State owned public lands. Private lands are mostly agricultural land (orchards, row crops, rice), with some private duck-hunting clubs, farmsteads, businesses, trailer parks, and isolated homes.

Each of the four counties in which the Refuge acquisition boundary is located has its own General Plan that outlines land use policies. The Policy Plan, volume I of the Glenn County General Plan (QUAD Consultants 1993), contains several sections that regulate local land uses. Those that apply to the proposed action are Section 5.1.1, "Agriculture/Soils"; Section 5.3.1, "Land Use/Growth"; and Section 6.7, "Coordination with Wildlife and Land Management Agencies".

5.1.1 Agricultural/Soils

As the most extensive land use in the county, agricultural constitutes a significant component of the local economy. Agricultural land also provides valuable open space and important wildlife habitat. It is important that the County take steps to preserve its agricultural land from both economic and environmental perspectives.

. . . Converting prime agricultural land to non-agricultural uses is considered an irreversible loss of resources. . . . With the primary goal being that preserving county's valuable agricultural resources, a variety of preservation tools can be used. . . .

Policy NRP-1. Maintain agriculture as a primary, extensive land use, not only in recognition of the economic importance of agriculture, but also in terms of agriculture's contribution to the preservation of open space and wildlife habitat.

5.3.1 Land Use/Growth

Agriculture is the single most important component of the county's economic base, protection of agricultural land is of great importance. Land use patterns, goals and policies have been

established which promote agricultural land preservation and protect these lands from urban encroachment.

... It is the intent of the County to promote orderly growth by directing new growth into areas where it can be accommodated and served adequately, and to avoid potential land use conflicts through the appropriate distribution and regulation of land uses. Only compatible uses will be encouraged in agricultural areas; compatible uses are defined as those uses capable of existing together without conflict or ill effect.

6.7 Coordination with Wildlife and Land Management Agencies

For all projects, with the exception of those associated with sites low in wildlife value, early consultation with wildlife agencies should occur.

Demographics

In the first 150 years of statehood, California grew from fewer than 100,000 citizens in 1850 to almost 34 million in 2000 (California Department of Finance 2002). Between 1950 and 2000 alone, California's population increased by 200 percent (California Department of Finance 2002). If California continues to add nearly 500,000 persons each year, by 2012, the population could easily exceed 40 million. The 50-million mark will be passed sometime between 2030 and 2040 if current growth rates persist (California Department of Finance 2002).

The Central Valley has been one of the fastest growing areas in California during the last few decades. As of July 1997, the Central Valley had seventeen percent of the State's population (Munroe and Jackman 1999). In 2005, Butte County's population was 214,120 and is expected to increase to 261,428 residents by 2020 (California Department of Finance 2005). The racial makeup of the county was 84.5 percent white, 10.4 percent Hispanic, 3.3 percent Asian, 1.9 percent Native American, 1.4 percent African American, with the remaining percentage from other races (Percentage total can be greater than 100 percent because Hispanics can be counted in multiple races, US Census Bureau 2000).

In 2005, Glenn County's population was 28,200 and is expected to increase to 32,000 residents by 2020 (California Department of Finance 2005). The racial makeup of the county was 71.8 percent white, 29.6 percent Hispanic, 3.4 percent Asian, 2.1 percent Native American, 0.6 percent African American, with the remaining percentage from other races (Percentage total can be greater than 100 percent because Hispanics can be counted in multiple races, US Census Bureau 2000).

Colusa County is home to 20,800 residents and is projected to increase to 26,000 residents by 2020 (California Department of Finance 2005). The racial makeup of the county was 64.3 percent white, 46.5 percent Hispanic, 2.3 percent Native American, 1.2 percent Asian, 0.5 percent African American, with the remaining percentage from other races (Percentage total can be greater than 100 percent because Hispanics can be counted in multiple races, US Census Bureau 2000).

In 2005, Tehama County's population was 60,020 and is expected to increase to 83,569 residents by 2020 (California Department of Finance 2005). The racial makeup of the county was 84.8 percent white, 15.8 percent Hispanic, 2.1 percent Native American, 0.8 percent Asian, 0.6 percent African American, with the remaining percentage from other races (Percentage total can be greater than 100 percent because Hispanics can be counted in multiple races, US Census Bureau 2000).

In January 2002, TNC facilitated The Sacramento River Public Recreation Access Study (EDAW 2002). The primary purpose of the study was to "...assess existing and potential public recreation uses, access, needs, and opportunities along the Sacramento River between Red Bluff and Colusa." The goals of the study were to 1) identify and characterize existing public access opportunities and needs associated with public recreation facilities and infrastructure... 2) and to identify and make recommendations for future public recreation access opportunities and management programs..." The study areas were developed so that data would be meaningful and useful to the partners that are developing management plans.

Two study areas are portrayed (EDAW 2002): 1) the local study area comprising Tehama, Butte, Glenn, and Colusa counties and 2) the regional study area encompassing 20 adjacent counties where there is reasonable likelihood of recreational visitation.

EDAW (2002) depicts a profile of the potential local refuge visitor as predominately Caucasian, 31-50 years of age, some college education/trade school education with a household income under \$20,000 to \$40,000 (median income \$31-35,000). The current population in the local four counties is expected to grow by 55 percent, in contrast to the adjacent 20 counties, which are expected to grow by 25 percent (EDAW 2003). There is a significant Hispanic population, including one-half of the residents of Colusa County, and about one-third of the residents of Glenn County. The local area residents tended to have lower household income brackets than their regional counterparts.

Cultural Resources

Information from Service cultural resources division staff and the Northeast Information Center of the California Historical Information System at California State University (CSU) Chico verified that the areas bordering the Sacramento River are considered sensitive for both prehistoric and historic cultural resources. Additionally, these areas may be used as traditional cultural properties.

The CSU Chico Research Foundation Archaeological Research Program (ARP) conducted an archeological study of the middle Sacramento River floodplain in 2002, leading to the comprehensive Cultural Resource Overview and Management Plan – Sacramento River Conservation Area (White et al. 2003). The study

completed an archaeological survey, assisting the Service in meeting cultural resource inventory mandates as specified in Sections 106 and 110 of the National Historic Preservation Act. The final overview, assessment, and management plan provides a summary of the status of known cultural resources, a sensitivity study for resources yet-to-be identified, and general plans for future scientific investigations, public interpretation of archaeological and paleo-environmental findings, and administration and coordination for future actions which may affect cultural resources.

The Codora Unit, which has been in orchard operation, was not included in this study. Therefore, the Refuge completed a Request for Cultural Resource Compliance Review to comply with the National Historic Preservation Act, Section 106. The Service's Cultural Resources Office (Region 1) has reviewed the proposed project and determined that no impacts to cultural resources are anticipated, therefore, no further cultural resource identification is necessary (USFWS Memo 2008).

Chapter 4. Environmental Consequences

This chapter analyzes the environmental impacts expected to occur from the implementation of the alternatives described in Chapter 2. Impact evaluation has been conducted for each aspect of the environments described in Chapter 3, including physical, biological, and social and economic resources. Direct, indirect, and cumulative impacts are described where applicable for each alternative. Alternative A (No Action) is a continuation of management practices that are in place today and serves as a baseline against which Alternatives B and C are compared.

The National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) 1502.16 regulations require a discussion of mitigation measures when adverse impacts to habitats, wildlife, or the human environment are identified. All potential impacts were considered and mitigation measures were identified for Alternatives B and C.

In describing the significance of impacts, the Service defers to NEPA Implementing Regulations at 40 CFR 1508.27.

"Significantly" as used in NEPA requires considerations of both context and intensity:

(a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

(b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. “

Significance of impacts to the human environment determines whether preparation of an EIS is warranted. Thus, an EA provides a discussion of the magnitude of the impacts within the context of the situation for each impact topic.

Effects on the Physical Environment

Geology and Soils

Alternative A (No Action) could result in an increase in erosion and sedimentation rates, since there would be no replanting of native riparian vegetation after orchard removal. Natural recruitment of native vegetation would take some time, leaving the soil more vulnerable to erosion and sedimentation than if the area was restored to native habitat.

Several site preparation activities would be conducted as part of Alternatives B and C to prepare the refuge units for planting. Some of these activities, such as orchard removal, infrastructure removal, and light land grading, would involve some soil disturbance and may temporarily increase erosion and sedimentation rates in the project area. However, any temporary increase in erosion and sedimentation rate would be offset by the substantial long-term reduction in erosion and sedimentation rates that would result from taking the refuge units out of agricultural production and restoring them to native riparian habitat.

Mitigation Measures to Address Erosion Risks:

- Orchard removal and other ground disturbing activities will be conducted during the dry season (late spring/ early summer) to reduce the potential for erosion, sediment discharge, and flood debris.
- The restoration area will be disked and planed following orchard removal. The planing will tighten the soil and reduce the chance of erosion.

Hydrology

Under the no action alternative there would be no change in hydrology until the orchard is removed when it is no longer productive. Orchard removal with no replanting of vegetation would destabilize the bank and increase erosion and sedimentation rates. Under Alternative B, the Revised Flood Neutral Hydraulic for Riparian Habitat Conservation on the Sacramento River at Beehive Bend, RM 163-176 (Ayers Associates 2005) indicates that the 274.5-acre restoration area may support the proposed riparian vegetation while retaining flood neutrality between River Miles 163 and 176. According to the hydraulic analysis, planting the unit with 208 acres of savannah and less than 60 acres of riparian forest will result in no net increase or decrease in flood water surface levels in the Beehive Bend subreach of the Sacramento River Flood Control Levee System. According to Ayers Associates (2001), the preferred land cover configuration originally included a mix of riparian vegetation, orchard, and grass/sedge meadow and was developed in order to minimize hydraulic impacts while providing environmental benefits. Savannah habitat will dominate the restoration under Alternative B and will be maintained by the Refuge to provide a corridor for flood flows in the future. Because Alternative C does not maintain flood neutrality within the Beehive Bend subreach, Alternative B was selected to mitigate those adverse hydrological impacts.

Water Quality/Contaminants

Under the no action alternative there would be no change in water quality/contaminants. Alternatives B and C include activities involving large earthmoving equipment that could result in the introduction of various contaminants, such as fuel oils, grease, and other petroleum products, either directly from equipment or

through surface runoff. Contaminants may be toxic to fish or adversely affect their respiration and feeding. With the implementation of the following mitigation measures, no adverse effects on fish would occur under either Alternatives B or C.

Mitigation Measures to Address Impacts on Water Quality:

- A variety of sediment control measures such as buffers or set backs from the River, silt fences, straw or rice bale barriers, brush or rock filters, sediment traps, fiber rolls, or other similar linear barriers can be placed at the edge of the project area to prevent sediment from flowing off site.
- The contractor will establish a spill-prevention and countermeasure plan before project construction begins; this plan will include on-site handling criteria to avoid input of contaminants to the waterway. A staging, washing, and storage area will be provided at least 100 feet away from the waterway for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants.
- No ground disturbing work will occur within the active channel of the Sacramento River.
- Exclusionary fencing will be used to mark boundaries of all waters to be avoided.
- Only state and locally approved herbicides will be used on the restoration site.
- Herbicide applications will be prescribed by a state-licensed PCA (pest control advisor) and applied by state licensed applicators.

In the long-term, restored vegetation on the Codora Unit under both action alternatives would have some filtering effect on overland flow by removing floating debris, minimizing erosion, and capturing sediment. Replacing flood-prone agriculture with restored riparian habitat will decrease pesticide and herbicide applications on land adjacent to the river, thereby increasing water and sediment quality. Restored riparian forests also buffer and filter toxic and organic matter that originate further away from the river, further enhancing water and sediment quality.

As stated in the Riparian Habitat Restoration Plan for the Codora Unit (Appendix A), The Nature Conservancy will follow all Glenn County and Department of Pesticide Regulation and USFWS Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area. Herbicide use will be reported to Glenn County as required by state and county law. Due to problematic weeds that could inhibit native plant growth if unchecked, weed control will be conducted year round on an as needed basis according to weather conditions.

Air Quality

Under the no action alternative there would be no change in air quality except for temporary increases in dust and tailpipe emissions from eventual orchard removal. Under Alternatives B and C, short-term increases in dust and tailpipe emissions due to orchard removal and restoration projects, which disturb the soil and/or require the use of heavy equipment work, will occur. However, Alternatives B and C would have an overall positive effect on air quality with the implementation of full restoration over time. With the implementation of the following mitigation measures, no adverse effects to air quality would occur.

Mitigation Measures to Address Impacts on Air Quality:

- Land disturbing operations will be suspended when winds exceed 20 mph to limit fugitive dust and particulate matter.
- Dust control measures (i.e. water trucks) will be utilized as necessary to manage dust on the project site.

Effects on the Biological Environment

Vegetation

Under the no action alternative, the orchard would not be removed until it is no longer productive and no active restoration would occur. Restoration under the action alternatives on this site would facilitate the establishment of native riparian habitat that without active cultivated restoration would return to native vegetation at a very slow rate or not return at all. Exotic weeds inhibit seedling establishment of native riparian vegetation and a diminished flood disturbance regime limit natural establishment of floodplain riparian communities.

No adverse effects on special-status plants or sensitive natural communities would occur from implementation of proposed habitat restoration with Alternative B or C. No restoration activities are proposed within existing natural areas, and such activities would be limited to existing orchards. No special-status plants species or sensitive natural communities are present within the orchards. Special-status plants and sensitive natural communities would benefit from implementation of the proposed habitat restoration, which would increase the acreage of forest, savannah, and grassland communities throughout the Sacramento River NWR. Beneficial effects include management to promote greater species diversity, protection from adjacent land uses, and an increase of natural communities. The existing riparian forest community would be protected and its habitat area expanded.

Under alternatives B and C, riparian restoration would have beneficial long-term impacts on the Refuge through the implementation of the various wildlife and habitat strategies associated with the Sacramento River NWR CCP (USFWS 2005). Habitat restoration fulfills the Service's congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds,

waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants. Implementation of alternative B and C would provide nesting habitat for species status migratory birds, particularly yellow-billed cuckoo and Swainson's hawk. VELB populations would likely increase through increased habitat (i.e., blue elderberry) at the restoration site only under Alternative B. Special status anadromous fishes would benefit from the restored forests and savannas providing shaded riverine aquatic habitat and future sources of large woody debris. Overall natural diversity would increase through restoration of native riparian floodplain vegetation (e.g., forests, savannas, grasslands, herblands) using local ecotypes of indigenous plant species.

Wildlife Resources

Under the no action alternative there would be little change in wildlife resources, since the orchard lands would initially remain intact and there would be no replanting of native riparian vegetation when the orchards are eventually removed. Alternatives B and C will result in short-term and long-term benefits and potentially some adverse impacts on wildlife initially. Short-term benefits include an elimination of pesticide application to the area, as well as increased habitat complexity in the new restoration compared to the orchard. Herbicide use will be limited to the initial stages of restoration. The restoration of 274.5 acres of riparian habitat could temporarily disturb wildlife (i.e. from construction noise, displace species using the orchard land). However, the temporary disturbance and displacement of wildlife is considered a minor effect. Walnut orchards do not provide high quality wildlife habitat and do not support high populations of native wildlife species. Once restoration is completed there will be a long-term benefit to wildlife because the restored native forest and savannah cover types will provide food and cover for a variety of riparian dependent wildlife species, compared to the existing orchard.

With riparian habitat restoration under Alternatives B and C, riverine fish fauna will benefit from the maintenance of sediment deposition, habitat diversity, restored shaded riverine aquatic habitat, overhanging vegetation, and seasonally available spawning and rearing habitats. However, project implementation could result in temporary impacts on fish species in the project vicinity during construction. Orchard removal, infrastructure modification, grading, and placement of the irrigation system cause loosening of the soil and could result in minor and temporary increases in sediment load to the river during a flood event. Increased input of sediment has the potential to increase turbidity, possibly reducing the feeding efficiency of juvenile and adult fish. Because the Sacramento River is typically a turbid system, additional sediment input resulting from project activity would be comparatively minimal. There would be no noticeable effect relative to the overall condition of the river, and sediment runoff from the restoration sites would only occur during storm effects.

As structural complexity of restoration sites are established, species richness will increase. Research has indicated that riparian restoration sites provide habitat for a diverse community of landbirds (Golet et al. 2008). This project is also expected to provide important breeding, spring staging, and winter habitats for migratory songbirds. As riparian restoration matures, habitat becomes suitable for an increasing number of other species. Furthermore, mature riparian forests support a much higher faunal diversity than orchards. For example, bat activity has shown to be higher in riparian forests than in orchards (Stillwater Sciences et al. 2003). Although the restoration proposed under Alternative C would provide greater benefits to wildlife using riparian forest habitats, Alternative B would provide a mosaic of riparian habitat types that could promote higher faunal diversity.

Not only have previous restoration projects along the Sacramento River been successful in providing habitat for special-status species, but they have been highly effective in revitalizing the larger native riparian community (Golet et al. 2008). Because the Codora Unit is bordered on all sides by existing riparian habitat and/or the Sacramento River, the proposed restoration will decrease habitat fragmentation and increase the level of connectivity across the larger riparian landscape.

Special Status Species

Under the no action alternative there would be no change in special status species. The habitat restoration proposed in Alternatives B and C will result in short-term and long-term benefits for special-status wildlife species. Immediate elimination of pesticide use, as well as the elimination of herbicide application after several years, will increase habitat suitability for special status species. Many of these species have declined due to loss of riparian forest and savanna habitats; therefore, restoration of these habitats will benefit these species. Restoration will facilitate the establishment of native riparian habitat that without active cultivated restoration would return to native vegetation at very slow rate or not return at all. Special status species expected to benefit from the Codora restoration include the western yellow-billed cuckoo, a state threatened and federal candidate species, and the federally threatened VELB. Restoring mixed riparian forest, valley oak savanna, and grasslands may also provide nesting, roosting, and foraging habitat for the Swainson's hawk, a federal species of concern. Native grassland restoration would benefit local bank swallow colonies through increases in insects, which are ideal prey for this species (Moffatt et al. 2005).

Indirect adverse effects on bank swallow, a California State Threatened species and a federal species of concern, are not likely to result from the conversion of agricultural habitats to riparian forest, although some biologists believe that an eroding bank without roots makes bank swallow nests less accessible to predators because predators cannot cling to roots while depredating swallow nests. Restoration activities are not likely to increase the amount of roots in eroding banks because restored areas would be converted from orchards to riparian habitat,

substituting one type of root for another. Furthermore, root density would be decreased along the majority of the bank as orchards are converted to savanna habitat under Alternative B.

By providing important floodplain rearing habitat and reducing agricultural inputs into the Sacramento River system, it is expected that winter-run Chinook salmon, spring-run Chinook salmon, steelhead trout, green sturgeon, and Sacramento splittail will also benefit from this project.

The levee district has expressed concerns that planting elderberry shrubs near levees could lead to the spread of VELB, with resulting special-status species issues. Landowners have also voiced concern that the presence of elderberry shrubs on adjacent refuge land would restrict current farming practices, especially spraying of agricultural chemicals. The Refuge has implemented a self-imposed, 100-foot valley elderberry shrub-free zone intended to buffer the boundaries between private orchards, levees, roadways and that of Refuge restoration sites so that agricultural pesticide drift from neighboring private orchards and facility and levee maintenance operations will not affect VELB habitat in restoration sites or adjacent landowner operations. No elderberry shrubs would be planted in this corridor, thereby reducing the likelihood that VELB would spread onto levees as a result of the restoration program. The proposed restoration areas in the Codora Unit are also bordered on all sides by existing habitat already managed by the Refuge where the levee and a 20 to 30 foot buffer from the toe to habitat is managed as vegetation-free.

Mitigation Measures to Address Impacts on Special Status Species:

- Refuge wildlife surveys will be conducted prior to orchard removal to make sure that nesting wildlife (i.e. bank swallow) will not be directly impacted or so that impacts can be minimized.
- If an active nest(s) is located within 500 feet of construction activities, it shall be mapped, and a qualified biologist will determine the extent of a construction-free buffer zone to be established around the nest until young have fledged.

(Pending: The USFWS (2008) and NOAA-Fisheries (2008) have concurred that the Codora Unit restoration is consistent with previous consultations listed below.) The Section 7 consultation with USFWS (2004) and NOAA-Fisheries (2004) concluded that the CCP (USFWS 2005) is not likely to adversely affect any of the special status species occurring on the Refuge. Alternatives B and C are consistent with the management described in the CCP and would not adversely affect any of the special status species. In addition, all activities are consistent with the programmatic Section 7 Consultation on Management, Operations, and Maintenance of the Sacramento National Wildlife Refuge Complex (USFWS 1999).

Effects on the Social and Economic Environment

Employment

Under the no action alternative, the orchard would be farmed until it is no longer productive, so there would be some employment opportunities maintained for the next several years. However, the orchard is losing productivity, therefore the availability of employment will continue to decline. The displacement of agricultural production due to orchard removal on the Codora Unit under Alternatives B and C would not represent a substantial loss of employment opportunities in Glenn County. Employment growth is expected to increase over the next several years, as a result of growth in the non-farm sector. As a result, any reduction in employment from taking the Codora Unit out of agricultural production would be offset by this growth.

Local Economy

There would be some revenue for the local economy maintained under the no action alternative, because the orchard would be farmed until it is no longer productive. However, the displacement of agricultural production due to orchard removal on the Codora Unit would not represent a substantial loss of crop production value to Glenn County. The Refuge is committed to conduct restoration in phases with older less productive orchards being targeted for restoration earlier (around 30 years). Although implementation of the proposed action would eliminate agricultural production on 274.5 acres of land along the Sacramento River, this land contains an orchard that is coming to the end of its productivity. Furthermore, it is the last orchard the refuge owns in Glenn County. The Refuge supports full payment to the county under the Refuge Revenue Sharing Program. That percentage is determined annually by Congress. However, these revenue sharing payments were instituted to mitigate the effects of property acquisition, not restoration.

There are a few potential effects on neighboring agricultural properties, such as loss occurring in the form of crop depredation from birds, rodents or mammals inhabiting newly planted riparian habitat. However, the proposed restoration areas within the Codora Unit are already bordered on all sides by existing habitat already in Refuge ownership, so any effects on surrounding properties would be minimal. Because the northern border of the restoration site is bordered by Highway 162, no trees or shrubs are to be planted within 100 feet of the causeway. Only native grasses will be established within 100 feet of the highway.

Mitigation Measures to Address Impacts on the Economy:

- The orchard is being phased out over time (USFWS acquired the orchard in 1994 and continued to lease for orchard production until the present) to reduce the impacts on the local agricultural economy.
- Local vendors will be used for restoration activities and materials whenever possible.

- Visitor service opportunities associated with the restoration will offset local economic impacts.

Land Use

The proposed action is compatible with Glenn County land use policies. Restoring the Codora Unit to riparian habitat will preserve valuable open space, provide recreational opportunities, and improve the quality of wildlife habitat. The restoration will protect water quality and quantity by providing a buffer strip between agricultural activities and the Sacramento River, and ground water wells will also be removed following restoration. By preserving this land as wildlife habitat and open space, further protection against urban encroachment will be secured. The Glenn County Board of Supervisors (2008) encourages the proposed action because it will lead to public land being restored and made available for public recreational use.

From a land use perspective, the acreage to be converted has already been purchased by the Service. The prospective change in land use was approved previously and has remained as agriculture with the understanding that it would eventually be restored to native habitats. No additional changes are proposed as part of the restoration program. The Codora orchard is also becoming less productive, since phasing out of the orchard began 14 years ago. Currently, the orchard is at less than 65 percent of its original productivity, especially due to sick and lost trees. Along with a general policy regarding the protection of agricultural land, Glenn County also promotes protection and improvement of natural areas for the benefit of wildlife and calls for early consultation with wildlife agencies on all projects. The proposed action is consistent with these land use policies relating to natural habitat protection. In February of 2008, the Glenn County Board of Supervisors voted to support the request for California River Parkways funding for the Codora Unit restoration. Because the Refuge provides important recreation opportunities to citizens of Glenn County and other residents of California that contribute to the economy of Glenn County, habitat restoration of the Codora Unit is highly encouraged. Although county supervisors have been concerned about project impacts on the maintenance and operation of adjacent levees, this concern has been addressed to their satisfaction.

Demographics

All alternatives are expected to have no significant impacts to demographics of Glenn County and the surrounding region.

Cultural Resources

Minor impacts to cultural resources are minimized through cultural resource reviews and surveys. Under Federal ownership, archaeological and historical resources within a Refuge receive protection under Federal laws mandating the management of cultural resources, including, but not limited to, the Archaeological

Resources Protection Act; Archaeological and Historic Preservation Act; Native American Graves Protection and Repatriation Act, and National Historic Preservation Act. Under all alternatives, if any additional cultural resources were discovered on the Refuges, the Service would take all necessary steps to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

Compliance with Section 106 of the National Historic Preservation Act has been completed for the Codora Unit restoration. The Service's Regional Archeologist has evaluated the potential impact of the proposed restoration on cultural resources on the Codora Unit, and no impacts to cultural resources are anticipated from the project (USFWS Memo 2008). The restoration activities would only take place in current orchard lands where no impacts to cultural resources are anticipated. Since the site was cleared of native habitats between the late 19th and early 20th centuries and has been used as an orchard for many years, any cultural resources in the top several feet of the soil have most likely already been disturbed. No further cultural resource identification is necessary for the project. However, if cultural resources are discovered during project implementation, any ground disturbing activity will be halted, and the Regional Archaeologist will be notified.

Environmental Justice

On February 11, 1994, the President issued Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations") requiring that all Federal agencies achieve environmental justice by "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Environmental justice is defined as the "fair treatment for peoples of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. The developing environmental justice strategy of the Service extends this mission by seeking to ensure that all segments of the human population have equal access to America's fish and wildlife resources, as well as equal access to information that will enable them to participate meaningfully in activities and policy shaping. Restoration of the Cordora Unit would not disproportionately affect any minority or low-income populations.

Unavoidable Adverse Impacts

None of the proposed alternatives would have unavoidable adverse impacts on the environment, except for adverse flood impacts under Alternative C.

Irreversible and Irretrievable Commitments of Resources

None of the proposed alternatives would result in an unavoidable or irretrievable commitment of resources.

Short-term Uses versus Long-term Productivity

The habitat protection and management program proposed as part of the Refuge System is permanent and exclusively dedicated to maintaining the long-term productivity of the Refuge habitats and recreational opportunities. The local short-term uses of the environment would include increased management of wildlife habitats and development of public use opportunities. The resulting long-term productivity would include increased protection and survival of endangered species as well as a myriad of plant and animal species.

Cumulative Impacts

Cumulative effects (or impacts) are those effects on the environment resulting from incremental consequences of the Service's proposed actions when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these actions. Cumulative effects can be the result of individually minor impacts, which can become significant when added over a period of time. Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area.

Both action alternatives would have long-term benefits for native wildlife species and habitats within the Codora Unit, as well as the neighboring Packer and Sul Norte Units. The development and protection of wildlife habitats within the Refuge would represent a benefit to the long-term conservation of threatened and endangered species and other native wildlife species. Alternatives B and C would provide greater benefits due to the increased amount of habitat restoration that would take place. The restoration proposed under Alternative B would provide a mosaic of riparian habitat types that could promote higher faunal diversity. Alternative C would provide greater benefits to wildlife using riparian forest habitats, as the density of riparian vegetation in the restoration would be increased.

The hydraulic model used to evaluate the effects of the proposed project models the Beehive Bend Subreach of the Sacramento River between River Mile 163 to 176 taking into account all known past and projected restoration projects planned along the 13-mile stretch. Agricultural land use changes were also updated as part of the modeling exercise taking into consideration the cumulative effects of land use changes throughout the Beehive Bend Subreach (Ayers 2005 and 2007). The modeling results of the Proposed Action by Ayers Associates (2001 and 2005) meet all evaluation criteria (water surface elevation, freeboard). By converting areas of orchard to savanna habitat, water surfaces will be reduced which will compensate for converting other areas to riparian vegetation. The proposed restoration configuration takes into account areas where water surface elevations are especially sensitive to additional riparian plantings, including the highway 162 bridge at RM 168.5. The Proposed Action results in minimal change to water surface elevation and freeboard over existing conditions. The flood neutrality of the system will be

maintained within the project area. Ayres also concluded that there would be no impacts to the overflows into the Butte Basin.

There are many projects that benefit wildlife and habitats on the Sacramento River. The establishment of the Refuge and restoration that will be accomplished under the Restoration EA (USFWS 2002) both provide beneficial effects. The Refuge is also, just one of the many partners along the river that is restoring habitat for wildlife along the Sacramento River. However, despite these restoration efforts, there are ongoing activities such as water diversion and bank protection that continue to reduce native habitat along the Sacramento River. The proposed action will provide relatively modest increases in environmental benefits when compared to the historic and ongoing loss of native cover types. The Refuge encompasses only a small portion of the 382-mile long Sacramento River.

The greatest past, present, and foreseeable future impact in the vicinity of the Refuge is development. There is a clear trend in California of increasing development and associated habitat loss. Additional residential and commercial development may be planned throughout the local area. The Refuge does not have control over the cumulative negative impacts to native habitats from local development. However, the Refuge helps to mitigate impacts to native habitats by working with partners to protect important habitats from development and by restoring native habitats within the Refuge.

None of the alternatives are expected to have adverse cumulative impacts on the economy. Adherence to the policies and regulations pertaining to the protection of cultural resources would avoid any cumulative effects as a result of implementing any of the action alternatives.

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APPENDIX B

Codora Unit Sacramento River Mile 168.5 – 167.5 Riparian Habitat
Restoration and Management Plan

**Exhibit A.
Codora Unit
Sacramento River Mile 168.5 – 167.5**

Riparian Habitat Restoration and Management Plan



Prepared by:
Northern Central Valley Office
500 Main St.
Chico, CA 95928

Prepared for:
The U.S. Fish and Wildlife Service
Sacramento National Wildlife Refuge Complex

September 2008

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MAPS

RESTORATION PLAN SUMMARY

LOCATION	Unit Name	Codora
	Street address	Highway 45
	City	West of Butte City
	County	Glenn
	APNs	013-180-17 and 013-140-19
	River miles	168.5 – 167.5
RESTORATION SUMMARY	Restoration site area	274.5 acres
	Plant communities	Mixed Riparian Forest: 28.5 acres Cottonwood Riparian Forest: 30 acres Valley Oak Savanna: 208 acres NW Grassland: 8 acres
	Planting density (emitters/acre)	Mixed Riparian Forest: 132 Cottonwood Riparian Forest: 132 Valley Oak Savanna: 66
	Spacing (strip x row)	Mixed Riparian Forest: 11' x 30' Cottonwood Riparian Forest: 11' x 30' Valley Oak Savanna: 11' x 60'
FUNDING SUMMARY	Funded by	TBD
	Agreement #	TBD
	Agreement term	TBD
RESTORATION MANAGER	Unit manager	The Nature Conservancy
	Phone number	(530) 897-6370
	Address	The Nature Conservancy 500 Main St. Chico, CA 95928

EXECUTIVE SUMMARY

The Nature Conservancy (the Conservancy) is proposing to implement 274.5 acres of riparian habitat restoration on the approximate 399-acre Codora Unit. The Codora Riparian Habitat and Restoration Management Plan details the restoration plan agreed upon by members of the Conservancy's Sacramento River Project team and approved by the U.S. Fish and Wildlife Service's Sacramento River National Wildlife Refuge Assistant Manager and Wildlife Biologist.

The restoration plan is based on implementation techniques practiced and refined by the Conservancy on prior restoration projects along the Sacramento River. This restoration plan is consistent with the Final Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge (USFWS 2005), and the results of the Beehive Bend Hydraulic Modeling report (Ayers Associates 2005 and 2007). The plan describes a specific restoration design based on the environmental conditions and ecological goals at the Codora Unit, and the procedures for implementation of site preparation, planting/seeding, maintenance, and monitoring.

INTRODUCTION

A. Property Description

The 399-acre Codora Unit is owned by the U.S. Fish and Wildlife Service (USFWS) and managed as part of the Sacramento River National Wildlife Refuge (the Refuge). Within the Codora Unit is a 274.5-acre walnut orchard to be restored to native riparian habitat. The Codora Unit is bounded on the east by the Sacramento River and the south, west, and north by USFWS property (Packer Island and Sul Norte).

B. Location

The Codora Unit is located on the Sacramento River in northern California (Map 1) along the west bank of the Sacramento River at river mile 168.5-167.5 (Map 2). The Unit is in Glenn County west of Butte City between Colusa and Hamilton City at the intersection of state highways 162 and 45. The site is located in the Beehive Bend subreach (RM 178-164) between the USFWS's Sul Norte and Packer Lake Units (Map 2). Restoring 274.5 acres on the Codora Unit will complement the 820 previously restored acres for a total of 1,098.5 restored acres in the Beehive Bend Subreach.

C. Site History

The site was cleared of native habitats between the late 19th and early 20th centuries. The USFWS purchased the Codora Unit in 1995 and has managed the unit for habitat and walnut production since 1995 in anticipation of restoration.

D. Significance of Restoration

The Sacramento River is a fundamental state water source that drains 24,000 square miles of the northern Central Valley and supplies 80% of freshwater flowing into the Bay-Delta (CA State Lands Commission 1993). Historically, the river was lined by approximately 800,000 acres of riparian forest (Katibah 1984). Over 95% of this habitat has been lost, however, to selective logging, agriculture, urban development, and flood control and power generation projects. Cumulatively, these changes have greatly stressed the Sacramento River and associated species. The loss and degradation of riparian habitat has greatly diminished the river's ability to support viable wildlife populations and encouraged the invasion and proliferation of non-native invasive species. Two-thirds of the linear extent of the river's banks have been modified and confined by levees and riprap. Channelization, bank protection, and the construction of the Shasta Dam degraded riparian habitat along the Sacramento River by restricting the dynamic forces that promote natural habitat succession and regeneration.

Healthy riparian habitats contain a great number of flora and fauna due to the range of community types, overall structural diversity, availability of water and soil moisture, potential as corridors for migration, and critical breeding grounds (California State Lands Commission 1993, California Resources Agency 2000). Additionally, riparian corridors provide two primary functions essential to maintaining water quality: 1) moderating stream temperature and 2) reducing sediments and nutrients emanating from upland agriculture (Castelle *et al.* 1994). The loss of high-quality habitat and the decrease in water quality along the Sacramento River has caused many native species populations to become critically endangered. Important at-risk species include the Sacramento splittail, green sturgeon, chinook salmon, steelhead trout, western yellow-billed cuckoo, Swainson's hawk, least Bell's vireo, and Valley elderberry longhorn beetle (VELB) (CALFED 2000). Several recently published papers (Gardali *et al.* 2006, Golet *et al.* 2008) provide clear evidence that Sacramento River restoration sites provide positive benefits to neotropical landbirds, as well as

resident birds and other species. TNC's restoration approach and lessons learned are well described in the published literature (see for example Hujik and Griggs (1995a, 1995b), Griggs and Peterson (1997), Alpert et al. (1999), Griggs and Golet (2002), and Holl and Crone (2004).

Although severely degraded, the Sacramento River is still the most diverse and extensive river ecosystem in California (California State Lands Commission 1993). In an effort to improve ecosystem health in the region, federal, state, and local governments, as well as non-government organizations, have begun to implement a series of ecosystem restoration programs along the river. In 1986, the California State Legislature passed Senate Bill 1086, which mandated the development of a management plan for the Sacramento River and its tributaries to protect, restore, and enhance fisheries and riparian habitat (California Resources Agency 2000). The Sacramento River Conservation Area Forum (SRCAF) non-profit organization formed and set as its primary goal the preservation of remaining riparian habitat and reestablishment of a continuous riparian corridor along the Sacramento River from Red Bluff to Colusa.

E. Objectives

1. Short-term objective

The short-term goal for the Project is to plant a diverse mosaic of riparian communities on 274.5 acres in spring Project Year 2. Exotic weeds that inhibit seedling establishment of native riparian vegetation and a diminished flood disturbance regime limit natural establishment of floodplain riparian communities, therefore it is necessary to conduct active horticultural restoration such as planned for the Codora (Peterson 2002). Restoration on this site facilitates the establishment of native riparian habitat that without active cultivated restoration would return to native vegetation at a very slow rate or not return at all.

2. Long-term ecological objectives

The long-term goal of the Codora restoration project is to improve the ecological health and long-term viability of at-risk species and riparian communities along the Sacramento River by restoring riparian habitat and improving water quality through active horticultural restoration.

Restoring the Codora Unit may benefit a multitude of special-status Sacramento River aquatic and riparian taxa including diverse species of fish (e.g., Sacramento splittail [*Pogonichthys macrolepidotus*], green sturgeon [*Acipenser medirostris*], chinook salmon [*Oncorhynchus tshawytscha*], steelhead trout [*Oncorhynchus mykiss*]), birds (e.g., Western Yellow-billed Cuckoo [*Coccyzus americanus occidentalis*], Swainson's Hawk [*Buteo swainsoni*], Bank Swallow [*Riparia riparia*], bald eagle [*Haliaeetus leucocephalus*], mammals (e.g., western mastiff bat [*Eumops perotis*]), Yuma myotis [*Myotis yumanensis*]) and insects (e.g., valley elderberry longhorn beetle [*Desmocerus californicus dimorphus*]). The proposed project will promote the recovery of these species by providing much needed habitat (CBDA ERP Goals 1 and 4, CALFED 2000).

Based on the ecological conditions found in naturally occurring riparian forests along the Sacramento River from Red Bluff to Colusa, TNC's ecological objectives for this site are:

a. To establish early-successional stage and late-successional-stage riparian communities which have been severely reduced in extent along the Sacramento River since 1850.

The Project will add riparian habitat to an ecologically important tributary area important to the health and survival of riparian obligate species. Restoring complex riparian habitat in the area will improve habitat for fish and wildlife. Fish benefit from complex riparian areas that become flooded at high flows, slow floodwaters down and provide refugia for young and juvenile fish. Additionally, large woody debris, a result of increased riparian habitat, provides food and cover for critical life stages of anadromous fish (Bryant 1983).

b. To provide habitat for neo-tropical migrant land birds.

Both aquatic and terrestrial at-risk riparian species, as well as common riparian species, will benefit from protection and restoration of large expanses of habitat along the mainstem and at the confluences of tributaries to the Sacramento River.

c. To provide habitat for the elderberry longhorn beetle

The establishment of *Sambucus mexicana* (elderberry) shrubs may provide potential habitat for the federally endangered valley elderberry longhorn beetle.

d. Improve water quality by decreasing sediment and pesticide runoff into the Sacramento River.

Replacing flood-prone agriculture with restored riparian habitat will decrease pesticide and herbicide applications on land adjacent to the river, thereby increasing water and sediment quality. Additionally, restored riparian forests will buffer and filter toxic and organic matter that originate further away from the river, thereby further enhancing water and sediment quality

3. Management Objectives

The management objectives, which are implementation standards for achieving the ecological objectives, are outlined as follows:

- a. Meet, or exceed, a survival of at least 80% planted woody plants per acre by December 2012 (Project Year 4).
- b. Meet, or exceed, herbaceous density of 80% or greater by December 2012 Project Year 4).

F. Permits

1. NEPA

The USFWS will complete an Environmental Analysis (NEPA) of the project by December 2008.

2. CEQA

If state funding is secured, a CEQA analysis will be required. TNC will work with WCB to determine the appropriate CEQA analysis needed for the project.

3. Pesticide Use Permits

TNC will follow all Glenn County and Department of Pesticide Regulation and the U.S. Fish & Wildlife Service Policy for Pesticide Use Permits requirements concerning the application of herbicides for weed control in the Codora restoration area.

4. Encroachment Permit

This project is to be conducted on USFWS property and therefore is not required to obtain a floodplain encroachment permit from the Central Valley Flood Protection Board. However, the USFWS will provide the Central Valley Flood Protection Board with a copy of this plan for their review.

G. Agreements

TNC staff will implement the restoration at Codora. TNC oversees plant materials collection and propagation, site preparation and layout, planting, maintenance, monitoring, and reporting to the USFWS during the 3-year restoration implementation phase of the project. The USFWS will manage Codora in the long term according to their Comprehensive Conservation Plan for the SRNWR.

II. SCHEDULE OF ACTIVITIES

The timing of the annual activities for the establishment and maintenance phase of the restoration is outlined below.

Project Year	1				2				3				4			
Calendar	3/1/09-2/28/10				3/1/10-2/28/11				3/1/11-2/29/12				3/1/12-1/31/13			
Season	S	S	F	W	S	S	F	W	S	S	F	W	S	S	F	W
PLANNING																
NEPA compliance*																
CEQA compliance**																
Restoration Plan***																
PROPOGATION																
Nursery																
Cutting collection																
FIELDWORK																
Orchard removal																
Field preparation																
Layout																
Overstory planting																
Understory planting																
Understory seeding																
MAINTENANCE																
Weed control																
Irrigation																
MONITORING and																
Post-planting																
Regular check-in																
End of Season																
REPORTING																
Annual																
Completion																

*Completed in Fall 2008

**To be completed prior to funding approval.

***Completed in Summer 2008

III. PLANNING

A. Site Assessment

A site assessment was conducted by staff of The Nature Conservancy to determine the appropriate native riparian habitat to be restored on the Codora Unit. A soil survey was conducted by California State University in 1998 (CSUC 1998, Appendix 1) which is on file at the TNC office in Chico.

1. Soil Profile

Columbia silt loam, 0-2% slopes (Glenn County Soil Survey, 1968)

- 0-12 inches, pale brown, slightly hard silt loam that is brown and friable when moist.
- 12-58+ inches, pale brown, slightly hard silt loam and very fine sandy loam; contains stratified, thin layers of loamy fine sand and sands that are brown and friable when moist; common strong-brown mottles, especially in the finer textured layers that overlie sandy layers.

2. Vegetation

The Codora Unit is comprised of a 274.5-acre walnut orchard that is surrounded by 126 acres of existing remnant habitat, the habitat is primarily cottonwood riparian forest and valley oak forest in composition.

3. Hydrology

The Codora Unit floods every 1 to 5 years with the 274.5-acre restoration area in the 4-year estimated flood frequency interval (California Department of Water Resources).

The Memo – Amendment to Revised Flood Neutral Hydraulic for Riparian Habitat Conservation on the Sacramento River at Beehive Bend, RM 163-176 (Ayers Associates 2007) indicates that the 273 acre restoration area may support the proposed riparian vegetation while retaining flood neutrality between River Miles 163 and 176. According to the hydraulic analysis, planting the tract with riparian forest and savanna will result in a no net increase or decrease in flood water surface levels in the Beehive Bend subreach of the Sacramento River Flood Control Levee System.

Following the results of the hydraulic modeling, the site will be planted to a mosaic of cottonwood riparian forest, mixed riparian forest, and valley oak savanna.

4. Native Fish and Wildlife Usage

Special status terrestrial species that are expected to benefit from the Codora Unit restoration include the federally-threatened Valley Elderberry Longhorn Beetle, Western Yellow-billed Cuckoo, a state-endangered and federal candidate species, and the State-threatened Swainson's Hawk. By providing important floodplain rearing habitat and reducing agricultural inputs into the Sacramento River system, it is expected that winter-run Chinook salmon, spring-run Chinook salmon, steelhead, and Sacramento Splittail will also benefit from this project. This project will also provide important breeding, spring staging, and winter habitats for migratory songbirds.

Point Reyes Bird Observatory (PRBO) monitors bird usage at the Sacramento River, including Refuge units. PRBO has provided TNC and FWS with recommendations for restoring appropriate breeding and foraging habitat for riparian obligate songbirds at Codora.

B. Cultivated Restoration Design

Communities planned for habitat restoration are based on site assessments (including soil profile, topography, flood frequency and hydraulic modeling, depth to groundwater at base flows, weed community, and the existing riparian community). Species composition is determined by the ecological objectives, existing native species at and around the Codora Unit, and available understory seed.

1. Restoration Communities

A preliminary plan has been developed where we estimate that the Codora will be planted with four communities: cottonwood riparian forest, mixed riparian forest, valley oak savanna, and grassland (Map 3). This plan will be refined and finalized upon grant funds awarded to TNC and therefore may be slightly altered with further site analyses conducted.

2. Planting Design

Important note: No trees or shrubs are to be planted within 100 feet of the Highway 162 causeway, only native grasses will be established within 100 feet of the causeway (Map 3).

Refer to Appendix 2 for the planting composition. The arrangement of plants across the site in any given 10 row by 10 plant area will be arranged to maximize structural and compositional diversity both vertically and horizontally across the field. The planting strips will be aligned with the contour of the levee on the east side of the unit and the directional flow of the river on the west side (rows will run north to south in a curvilinear fashion).

Planting rows in the mixed riparian forest and the cottonwood riparian forest will be spaced 30 feet apart while rows in the valley oak savanna will be spaced 60 feet apart. Irrigation emitters will be spaced 11 feet along the planting rows. At each location there will be one overstory plant (tree or shrub) planted. An understory plant (shrub, forb, grass, or vine) will be planted either next to an overstory plant or clustered with other understory plants where appropriate. There will be no understory plants planted adjacent to willows, coyote brush, mulefat, cottonwood, sycamore, or rose as these plants grow quickly and would otherwise smother a companion plant.

3. Plant Propagation

Appendix 2 lists plant propagation method (container, cutting, plug, drilling) used for each species. Container plants are raised from seeds or cuttings collected from the Sacramento River floodplain and will be propagated by CSU Chico, Floral Native Nursery, and Hedgerow Farms for planting as seedlings at Codora. Willow and cottonwood cuttings are collected by TNC field staff, these are branches about 1" inches in diameter, 18 – 24 inches long cut from mature cottonwood and willow trees and planted directly into the field. Cuttings are collected in January and kept in cold storage for spring planting, prior to planting they are soaked in water for 24 hours.

TNC is responsible for the plant propagation for all of the riparian plants. Planting crews are hired and supervised by TNC.

C. Contracts

Services to be under contract include:

1. TNC's contract with California State University, Chico, greenhouse for plant propagation.
2. TNC's contract with the Floral Native Nursery, Chico, for plant propagation.
3. TNC's contract with Hedgerow Farms, Willows, for plant propagation.
4. TNC's contract with Manuel Quezada, Orland, for planting and maintenance labor.
5. TNC's contract with Circle R Irrigation, Yuba City, for irrigation system installation.

IV. RESTORATION IMPLEMENTATION

A. Field Preparations

TNC is responsible for field preparation prior to planting including clearing debris, disking, weed control (as necessary), and laying out the planting rows. Site layout is the preliminary stage of planting and occurs after field preparations have been completed. Site layout organizes the field according to the details outlined in the plant design (e.g. utilizing different colored flags to mark the planting space for an intended plant species) and is intended to facilitate planting efforts.

B. Irrigation Design and Installation

TNC will modify the existing irrigation system between September 2009 and spring 2010, prior to planting the native plants.

Important note: The irrigation system must be fully functional prior to planting because immediate irrigation may be needed to reduce transplant shock.

C. Planting

Phase 1 planting for the site is scheduled for spring of Project Year 2 (see Appendix 2) with the Phase 2 understory herbaceous layer to be directly seeded in November 2010 (Project Year 2). Plants will be spaced 11 feet apart in the strips and the rows are spaced at 30 feet (spacing = 11' x 30') in the cottonwood and mixed riparian forests while in the valley oak savanna rows are spaced at 60 feet apart, this results in 66 overstory plants per acre.

Protective milk cartons are to be placed around plants but not until after the threat of flooding has diminished. The cartons protect the plants from herbicide drift during weed control. Two small bamboo stakes are used to anchor the cartons.

TNC will use a rangeland drill to direct seed the understory in November 2010 (Project Year 2). Understory species used will be local ecotypes, preferably collected within 20 miles of the restoration site.

V. MAINTENANCE

Maintenance (irrigation and weed control) is scheduled to follow directly after the Phase 1 planting and continue for 3 years. The Phase 2 understory direct seeding planting will be maintained during Project Years 2, 3, and 4.

A. Restoration maintenance (spring Project Year 2 – December Project Year 4)

1. Irrigation

a. Method

Irrigation is the single most important factor in the success of riparian restoration projects in California. Adequate soil moisture allows plants to grow vigorously and compete effectively with weeds. If at anytime it is determined that either irrigation scheduling or the irrigation system is inadequate and plants are not growing actively, TNC will remedy this problem immediately.

b. Standards

Standards are based on plant growth and survival assessed during weekly assessments by TNC's Restoration Field Manager. Adequate soil moisture and weed control must be maintained to ensure vigorous plant growth. A water regime will be determined each week according to weather conditions.

2. Weed Control

a. Methods

This site has annual rye grass, Johnson grass, morning glory, chick weed, and other problematic weeds that will inhibit native plant growth if unchecked. Control efforts will concentrate on controlling these noxious weeds. Aggressive control by mowing, disking, and herbicide application will control these weeds as a serious problem in the restoration site.

Pesticide Use: The State of California and Glenn County regulate the use of all pesticides, only state and locally approved herbicides will be used on the restoration site. Herbicide applications will be prescribed by a state-licensed PCA (pest control advisor) and applied by state-licensed applicators. Herbicide use will be reported to Glenn County as required by state and county law. Weed control will be conducted year round on an as needed basis according to weather conditions.

b. Standards

The height and vigor of weeds on restoration sites has a direct effect on the growth and survival of the cultivated riparian plants. TNC's objective is to optimize growth of the riparian species past a point where they can compete effectively with these exotic plants, envisioned for December Project Year 4. The larger the riparian species the less they are affected by weeds.

TNC's standards for weed control for this project are as follows:

Project Year 2 growing season: No weed growth within the alleyways in preparation for understory native grass seeding. Weed growth in the planting strips is kept to less than 6".

Project Year 3 growing season: No weed growth within the alleyways. Direct seeded native grass will dominate the alleyways and compete with the non-native weeds. Weed growth in the planting strips is kept to less than 6".

Project Year 4 growing season: No weed growth within the alleyways. Direct seeded native grass will dominate the alleyways and compete with the non-native weeds. Weed growth in the planting strips is kept to less than 6".

VI. MONITORING

A. 30-Day Post-Planting Monitoring

TNC will conduct the 30 day post-planting assessments to determine the composition and survival of trees within the first month of planting (summer, Project Year 2). This provides baseline information for comparison at the end of each growing season (Project Year 2, 3, and 4) and for the Completion Report (January 2013, Project Year 4).

B. Weekly Site Conditions Monitoring

Post planting, TNC will check in weekly to ensure the site is being managed according to guidelines set forth in this document.

C. End of Growing Season Monitoring

This monitoring will be completed in November (Project Years 2, 3, and 4) before plants go dormant for the winter.

The criteria TNC uses to evaluate the immediate success of the planting are as follows:

1. Achieve a minimum 80% survival rate for all hand planted plants across all community types by December 2012 (Project Year 4).
2. Achieve an 80% native frequency in the understory direct seeded restoration component by December 2012 (Project Year 4).

End of Growing Season Monitoring is an interim assessment of the planting unit to determine success at the end of each planting season. This information is summarized later in the Annual Reports.

D. Annual Reports

Annual reports will be prepared by the Conservancy summarizing restoration activity for that year. The survivorship and height for each planted species are detailed and included in the report in tabular format. In addition, there will be a summary discussion of the previous year's work activities and the results of the survivorship and height data. Annual reports on the Codora restoration program will be submitted by January 31, Project Years 2, 3, and 4.

If the Year 2 or 3 Annual Reports indicate less than 80% overall survival for either forest or savanna communities, TNC will replant where necessary to ensure achieving a minimum 80%

survival rate for each community by the overstory restoration project December 2012 (Project Year 4).

E. Completion Report

A completion report will be prepared at the end of the 3-year maintenance phase (January 2013) to report the final survivorship and height of the restoration planting. Data on survivorship and height of the planted species will be provided in tabular format accompanied by text that will explain all activities during the 3-year maintenance phase and a summary discussion of the survivorship and height data of the restoration planting.

VII. CONTACTS

Title	Name	Phone number
Restoration Manager, TNC	Ryan Luster	(530) 897-6370, ext. 213
Assistant Refuge Manager, USFWS	Kelly Moroney	(530) 934-2801

VIII. REFERENCES

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IX. SIGNATURE PAGE

The U.S. Fish & Wildlife Service and TNC hereby approve the Codora Unit Riparian Habitat Restoration Plan (the “Plan”) for restoration of 274.5 acres of riparian habitat on the Codora Unit. The signatures below indicate approval to begin implementation of the Plan in all of its components. Any significant modifications to the Plan will be approved in writing by both parties.

United States Department of the Interior, Fish and Wildlife Service

By: _____

Kelly Moroney

Assistant Refuge Manager

Sacramento River National Wildlife Refuge

Date: _____

The Nature Conservancy,
a District of Columbia nonprofit corporation

By: _____

Ryan Luster

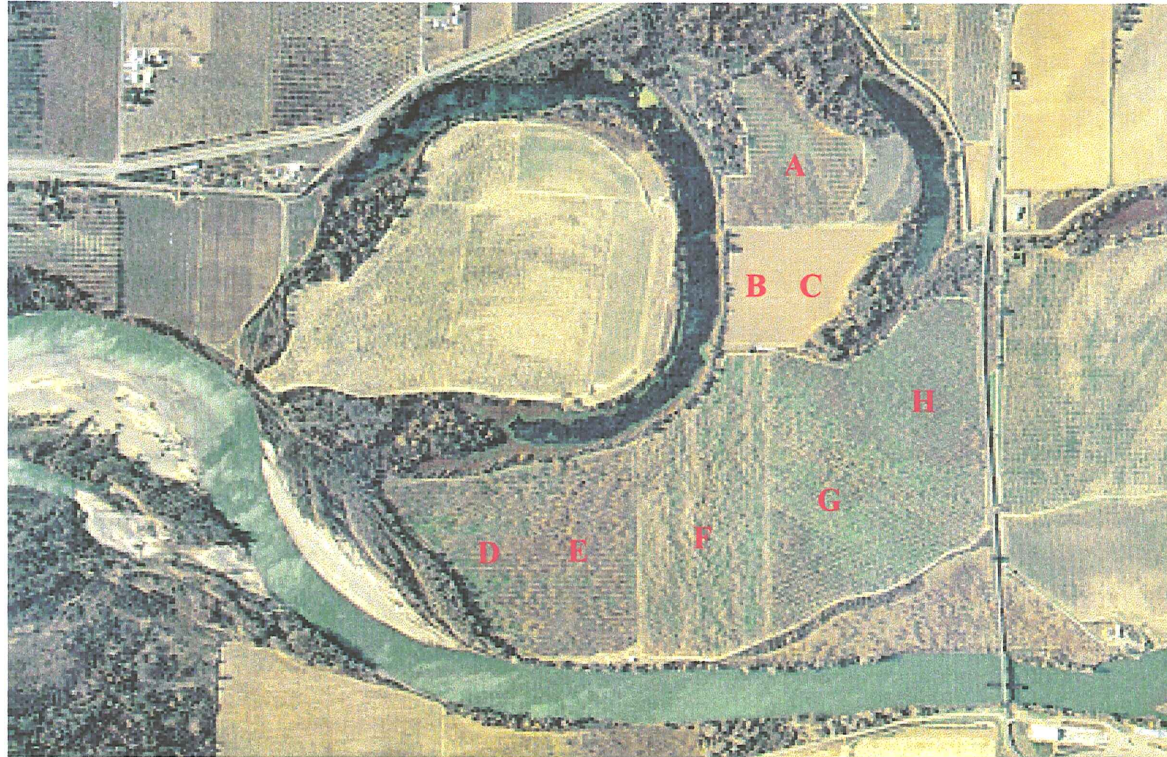
Restoration Program Manager

Sacramento River Project

Date: _____

APPENDIX 1. California State University, Chico 1998 soil survey of Codora.

CODORA



General Soil Map – Soil Associations:

22 – Columbia association: Deep, moderately well drained soils on recent flood plains.

Soils:

ChA – Columbia silt loam 0 to 2% slopes

- 0-12in, pale-brown, slightly hard silt loam that is brown and friable when moist.
- 12-58in+, pale-brown, slightly hard silt loam and very fine sandy loam; contains stratified, thin layers of loamy fine sand and sand that are brown and friable when moist; common strong-brown mottles, especially in the finer textured layers that overlie sandy layers.

CpB – Columbia silt loam, water table, 1 to 8% slopes

- These soils exist within old channels of the Sacramento River
- Water table is permanently high (typically even with that of the Sacramento River), drainage is poor

Field Data:

Date	Identification #	Depth (cm)	USDA SCS Classification	Texture	Munsell color	Notes
07/27/98	CD 1A	31	CpB	Clay loam	Very dark grayish brown	<ul style="list-style-type: none"> • Coloration beginning to increase in grayness at 59 cm. • Black coloring with rust mottling occurring at 115 cm. • Appearance of large aggregates of undecomposed woody debris and charcoal at 190 cm. • Increasing soil moisture at 210 cm. • Water table met at 270 cm.
	CD 2A	59		Clay loam	Very dark grayish brown	
	CD 3A	91		Sandy clay loam	Very dark grayish brown	
	CD 4A	136		Sandy loam	Very dark grayish brown	
	CD 5A	190		Sandy loam	Dark brown	
	CD 6A	226		Sandy clay loam	Dark brown	
07/27/98	CD 1B	33	CpB	Silty clay loam	Dark brown	<ul style="list-style-type: none"> • Increasing sand fraction at 124 cm. • Sand is very dry and unconsolidated. • Increasing soil moisture content at 176 cm. sand fraction still dominant. • Water table met at 217 cm.
	CD 2B	52		Clay loam	Dark brown	
	CD 3B	111		Loam	Dark brown	
	CD 4B	184		Sandy loam	Very dark grayish brown	
07/27/98	CD 1C	33	CpB	Sandy loam	Dark brown	<ul style="list-style-type: none"> • Sand fraction increasing at 104 cm. • Moisture content increasing at 152 cm. • Water table reached at 191 cm. • Profile very consistent from 104 cm.
	CD 2C	60		Sandy loam	Very dark grayish brown	
	CD 3C	104		Loamy sand	Very dark gray	
07/28/98	CD 1D	39	ChA	Silty clay	Dark grayish brown	<ul style="list-style-type: none"> • Loose unconsolidated sand layer at 153 cm. • Gravel met within sand layer at 300 cm. • Refusal reached at 308 cm due to the inability of soil to remain within the auger bit.
	CD 2D	58		Silty clay	Dark grayish brown	
	CD 3D	90		Silty clay loam	Dark grayish brown	
	CD 4D	128		Silty clay loam	Brown/Dark brown	
	CD 5D	173		Loamy sand	Dark gray	
07/28/98	CD 1E	33	ChA	Clay loam	Dark brown	<ul style="list-style-type: none"> • Rust/Dark-gray striations observed at 146 cm. • Dark rusty mottling at 179 cm. • Soil moisture increasing noticeably at 284 cm. • Gray coloration beginning to dominate soil matrix at 370 cm. • Water table reached at 437 cm. • Rust and gray coloration appeared continuously to the water table
	CD 2E	62		Sandy clay loam	Very dark grayish brown	
	CD 3E	120		Silty clay	Dark brown	
	CD 4E	146		Silty clay	Dark brown	
	CD 5E	179		Silty clay loam	Dark grayish brown	
	CD 6E	247		Silty clay loam	Dark brown	
	CD 7E	284		Silty clay loam	Dark brown	
	CD 8E	330		Clay loam	Dark brown	
	CD 9E	370		Sandy clay loam	Very dark grayish brown	

Date	Identification #	Depth (cm)	USDA SCS Classification	Texture	Munsell color	Notes
07/28/98	CD 1F	29	ChA	Silty clay loam	Dark grayish brown	<ul style="list-style-type: none"> • Dark brown almost black mottling seen at 86 cm. • Noticeable increase in sand fraction at 121 cm. • Profile has remained remarkably constant in color, texture and soil moisture until 361 cm. • Sand grain size increasing at 361 cm. • First noticeable increase in soil moisture at 404 cm. • Coloration changing from solid light-brown to gray with light-brown striations, soil is very wet at 421 cm. • Water table met at 449 cm.
	CD 2F	64		Silty clay loam	Dark brown	
	CD 3F	121		Sandy loam	Very dark grayish brown	
	CD 4F	361		Loamy sand	Very dark gray	
	CD 5F	421		Loamy sand	Very dark grayish brown	
08/02/98	CD 1G	33	ChA	Clay loam	Dark brown	<ul style="list-style-type: none"> • Soil moisture increased noticeably at 239 cm. • Profile very consistent in color and grain size. • Sand grain size increasing at 250 cm. • Large diameter gravel met at 269 cm. • Refusal at 272 cm, soil is too loose, dry, and unconsolidated.
	CD 2G	72		Sandy clay loam	Dark brown	
	CD 3G	123		Sandy clay loam	Dark brown	
	CD 4G	160		Loamy sand	Dark brown	
	CD 5G	200		Loamy sand	Dark brown	
	CD 6G	250		Loamy sand	Dark brown	
08/02/98	CD 1H	32	ChA	Silty clay loam	Dark brown	Refusal met at 112 cm. due to the inability to pass a layer of undecomposed woody debris and/or root mass.
	CD 2H	66		Sandy loam	Dark brown	

APPENDIX II. Restoration Community Composition

Valley Oak Savanna (VOS)

Phase 1 - Manual Planting

Density (plant by row)	11' x 60'
Emitter Density per Acre	66
Acres	208
Target Planting Date	Spring, Project Year 2
Total Locations	13,728
Total Plants	27,456

Canopy Structure	Species		Frequency	Total
Overstory	<i>Platanus racemosa</i>	Western sycamore	10%	1373
	<i>Quercus lobata</i>	Valley oak	35%	4805
Midstory	<i>Acer negundo</i>	Box elder	5%	686
	<i>Fraxinus latifolia</i>	Oregon ash	5%	686
	<i>Sambucus mexicana</i>	Elderberry	15%	2059
Understory	<i>Baccharus pilularis</i>	Coyote brush	10%	1373
	<i>Rosa californica</i>	California rose	10%	1373
	<i>Rubus ursinus</i>	California blackberry	5%	686
	<i>Toxicodendron diversilobum</i>	Poison oak	5%	686
			100%	13728
Herbaceous	<i>Carex barbarae</i>	Santa Barbara sedge	30%	4118
	<i>Muhlenbergia rigens</i>	Deergrass	10%	1373
Forbs	<i>Artemisia douglasiana</i>	Mugwort	18%	2471
	<i>Euthamia occidentalis</i>	California goldenrod	15%	2059
	<i>Urtica dioecia</i>	Hoary nettle	5%	686
Vines	<i>Oenothera hookeri</i>	Primrose	5%	686
	<i>Aristolochia californica</i>	California pipevine	10%	1373
	<i>Clematis ligusticifolia</i>	Clematis	5%	686
	<i>Vitis californica</i>	California grape	2%	275
			100%	13728

Phase 2 - Direct Understory Seeding

Acres	208
Seeding rate (lb/acre)	13
Target Planting Date	December, Project Year 2

Grass Species	Ecotype	Seeding Rate
<i>Elymus glaucus</i>	Parrott	20%
<i>Hordeum brachyantherum</i>	Yolo Co.	25%
<i>Leymus triticoides</i>	Yolo Co.	20%
<i>Nasella pulchra</i>	Llano Seco	35%
		100%

Mixed Riparian Forest (MRF)

Phase 1 - Manual Planting

Density (plant by row)	11' x 30'
Emitter Density per Acre	132
Acres	28.5
Target Planting Date	Spring, Project Year 2
Total Locations	3,762
Total Plants	5,643

Canopy Structure	Species		Frequency	Total
Overstory	<i>Platanus racemosa</i>	Western sycamore	20%	752
	<i>Populus fremontii</i>	Fremont cottonwood	14%	527
	<i>Quercus lobata</i>	Valley oak	10%	376
Midstory	<i>Acer negundo</i>	Box elder	12%	451
	<i>Baccharis salicifolia</i>	Mule fat	5%	188
	<i>Fraxinus latifolia</i>	Oregon ash	10%	376
	<i>Salix gooddingii</i>	Goodding's willow	5%	188
	<i>Salix lasiolepis</i>	Arroyo willow	5%	188
	<i>Sambucus mexicana</i>	Elderberry	5%	188
	<i>Baccharus pilularis</i>	Coyote brush	2%	75
Understory shrubs	<i>Rosa californica</i>	California rose	2%	75
	<i>Rubus ursinus</i>	California blackberry	5%	188
	<i>Toxicodendron diversilobum</i>	Poison oak	5%	188
			100%	3,762
Herbaceous	<i>Carex barbarae</i>	Santa Barbara sedge	20%	752
	<i>Muhlenbergia rigens</i>	Deergrass	5%	188
Forbs	<i>Artemisia douglasiana</i>	Mugwort	10%	376
	<i>Euthamia occidentalis</i>	California goldenrod	5%	188
	<i>Urtica dioecia</i>	Hoary nettle	3%	113
	<i>Oenothera hookeri</i>	Primrose	2%	75
Vines	<i>Aristolochia californica</i>	California pipevine	2%	75
	<i>Clematis ligusticifolia</i>	Clematis	2%	75
	<i>Vitis californica</i>	California grape	1%	38
			50%	1,881

Phase 2 - Direct Understory Seeding

Acres	28.5
Seeding rate (lb/acre)	13
Target Planting Date	December, Project Year 2

Grass Species	Ecotype	Seeding Rate
<i>Elymus glaucus</i>	Parrott	40%
<i>Hordeum brachyantherum</i>	Yolo Co.	25%
<i>Leymus triticoides</i>	Yolo Co.	35%
		100%

Cottonwood Riparian Forest (CWRF)

Phase 1 - Manual Planting

Density (plant by row)	11' x 30'
Emitter Density per Acre	132
Acres	30
Target Planting Date	Spring, Project Year 2
Total Locations	3,960
Total Plants	5,940

Canopy Structure	Species		Frequency	Total
Overstory	<i>Platanus racemosa</i>	Western sycamore	16%	634
	<i>Populus fremontii</i>	Fremont cottonwood	27%	1069
	<i>Quercus lobata</i>	Valley oak	10%	396
Midstory	<i>Acer negundo</i>	Box elder	4%	158
	<i>Alnus rhombifolia</i>	White alder	2%	79
	<i>Baccharis salicifolia</i>	Mule fat	5%	198
	<i>Fraxinus latifolia</i>	Oregon ash	5%	198
	<i>Salix gooddingii</i>	Goodding's willow	5%	198
	<i>Salix lasiolepis</i>	Arroyo willow	4%	158
	<i>Baccharus pilularis</i>	Coyote brush	2%	79
Understory	<i>Rosa californica</i>	California rose	5%	198
	<i>Rubus ursinus</i>	California blackberry	10%	396
	<i>Toxicodendron diversilobum</i>	Poison oak	5%	198
			100%	3960
Herbaceous	<i>Carex barbarae</i>	Santa Barbara sedge	20%	792
	<i>Carex praegracilis</i>	Slender sedge	5%	198
	<i>Muhlenbergia rigens</i>	Deergrass	2%	79
Forbs	<i>Artemisia douglasiana</i>	Mugwort	4%	158
	<i>Urtica dioecia</i>	Hoary nettle	10%	396
Vines	<i>Aristolochia californica</i>	California pipevine	5%	198
	<i>Clematis ligusticifolia</i>	Clematis	3%	119
	<i>Vitis californica</i>	California grape	1%	40
			50%	1980

Phase 2 - Direct Understory Seeding

Acres	30
Seeding rate (lb/acre)	13
Target Planting Date	December, Project Year 2

Grass Species	Ecotype	Seeding Rate
<i>Elymus glaucus</i>	Parrott	30%
<i>Hordeum brachyantherum</i>	Yolo Co.	25%
<i>Leymus triticoides</i>	Yolo Co.	45%
		100%

NW Grassland

Direct Understory Seeding

Acres 8
 Seeding rate (lb/acre) 13
 Target Planting Date December, Project Year 2

Grass Species	Ecotype	Seeding Rate
<i>Elymus glaucus</i>	Parrott	20%
<i>Hordeum brachyantherum</i>	Yolo Co.	25%
<i>Leymus triticoides</i>	Yolo Co.	20%
<i>Nasella pulchra</i>	Llano Seco	35%
		100%

Hand Broadcast Seeding

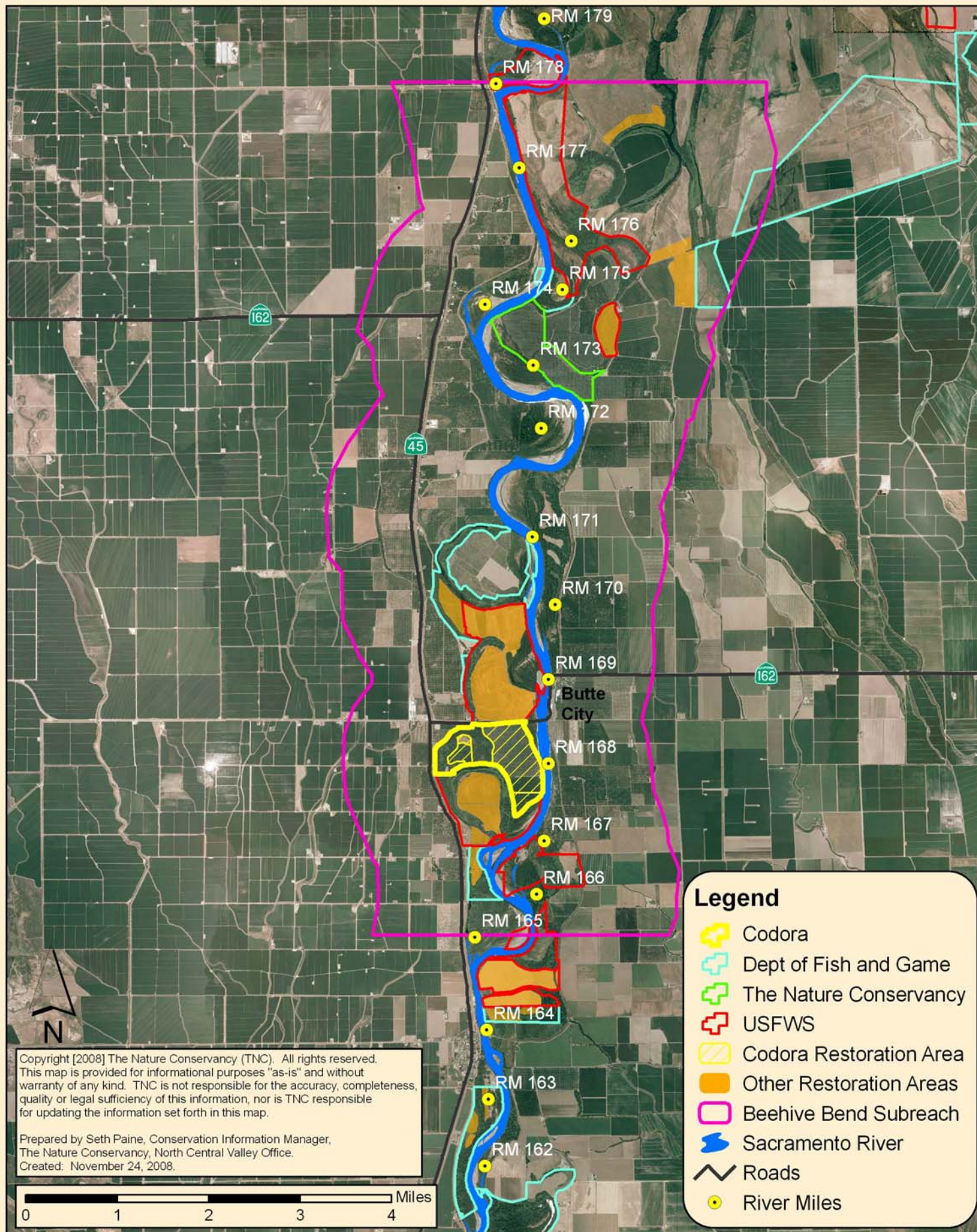
Species

Mugwort
Primrose
other species as appropriate

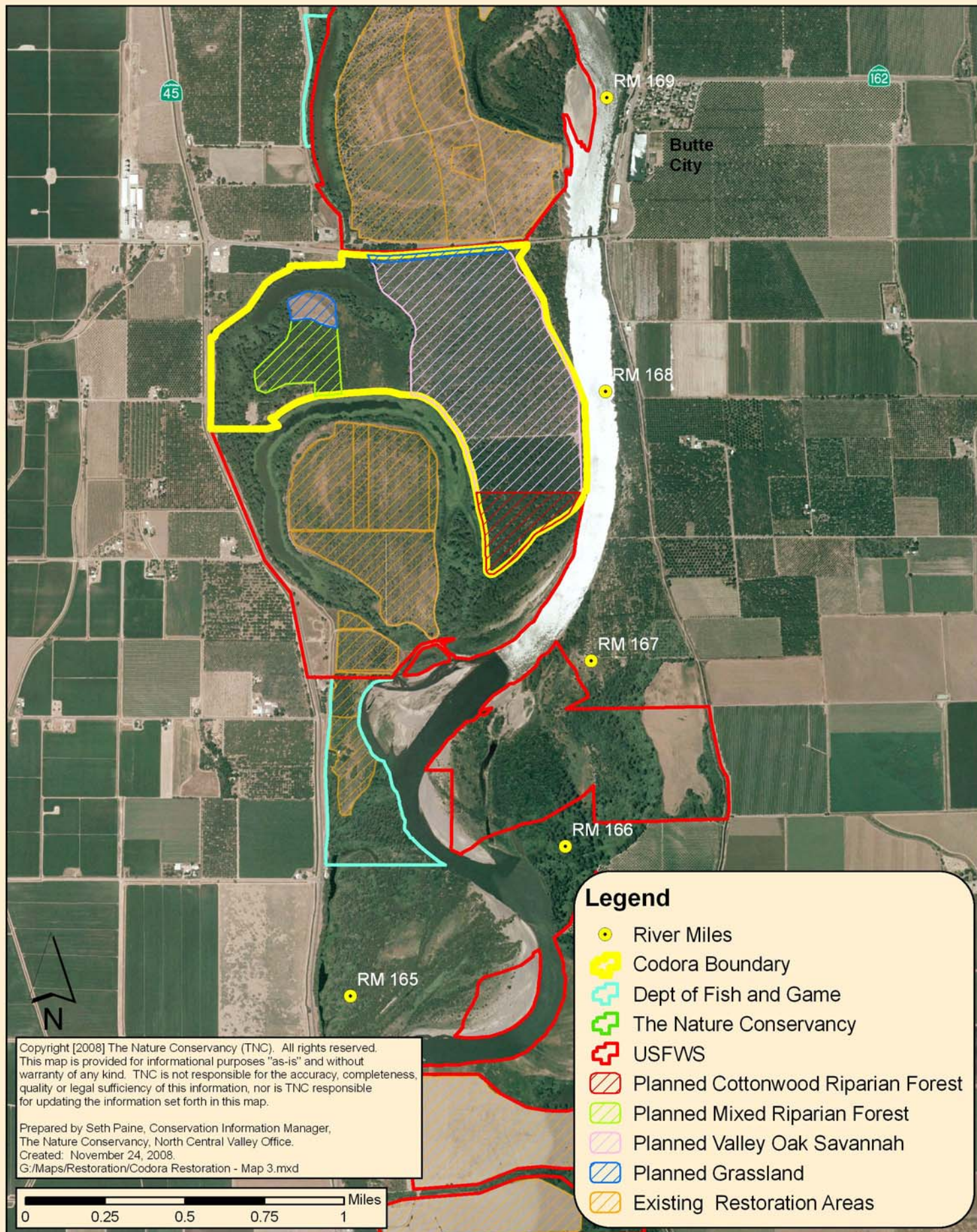
Map 1. Project Location



Map 2. Beehive Bend Subreach



Map 3. Codora Restoration



APPENDIX C

Revised Flood Neutral Hydraulic Analysis for Riparian Habitat Conservation
on the Sacramento River at Beehive Bend, RM 163 to RM 176 Glenn and
Colusa Counties, California

**REVISED FLOOD NEUTRAL HYDRAULIC ANALYSIS FOR
RIPARIAN HABITAT CONSERVATION ON THE SACRAMENTO
RIVER AT BEEHIVE BEND, RM 163 TO RM 176**

GLENN AND COLUSA COUNTIES, CALIFORNIA

December 12, 2005



Prepared for:



**The Nature Conservancy
500 Main Street
Chico, California 95928**

AYRES
ASSOCIATES

**REVISED FLOOD NEUTRAL HYDRAULIC ANALYSIS FOR
RIPARIAN HABITAT CONSERVATION ON THE SACRAMENTO
RIVER AT BEEHIVE BEND, RM 163 TO RM 176**

GLENN AND COLUSA COUNTIES, CALIFORNIA

December 12, 2005

Prepared for:



The Nature Conservancy
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Prepared By:

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Ayres Associates Project Number; 33-0542.00

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1.0 INTRODUCTION

This report updates a previous report entitled "Flood Neutral Hydraulic Analysis for Riparian Habitat Conservation on the Sacramento River at Beehive Bend, RM 163 to RM 176" dated September 25, 2003.

The purpose of this update is to investigate a proposed modification to the land use configuration in the September 25th report while maintaining a flood neutral water surface between the levees of the Sacramento River Flood Control System (SRFCS) and the outflow into the Butte Basin. The area proposed for this modified land use is the Grevie parcel adjacent to the east levee between RM 166 and RM 167.

The area of the hydraulic modeling in this study extends from river mile (RM) 163 to RM 176 on the Sacramento River in Glenn and Colusa Counties, California. The area is commonly known as Beehive Bend and is shown in **Figure 1**. The location of the proposed land use changes on the Grevie parcel is shown in **Figure 2**.

Three previously developed hydraulic runs plus one newly developed run are presented in this report. Two of the previous runs (existing and riparian) come from the hydraulic analysis report from April 2001 entitled "Hydraulic Analysis of Riparian Habitat Conservation on the Sacramento River from Princeton to Beehive Bend". The other previous run (flood neutral water surface) comes from the September, 2003 report referenced above. These models represent existing conditions and a previously proposed riparian vegetation conversions and restoration configurations. This new hydraulic run incorporates a riparian vegetation cover and restoration configuration on the Grevie parcel that will be flood neutral for the 100-year event.

This analysis was authorized by the The Nature Conservancy (TNC). The contact for TNC was Mr. Ryan Luster. The hydraulic analysis was performed by the Sacramento office of Ayres Associates under the direction of Mr. Thomas W. Smith P.E., G.E.

2.0 HYDRAULIC MODEL DEVELOPMENT

The hydraulic modeling tool used for this analysis was HEC-RAS, developed by the U.S. Army Corps of Engineers (USACE). The model geometry came from the Ayres Associates 2001 report model. The model used in the Ayres Associates 2003 report incorporated a previously developed model from RM 167 to 172, and was extended to RM 163 and RM 176.

The topography of the river and floodplain were taken from the US Army, Corps of Engineers 1997 river mapping. Structural information of the Highway 162 Bridge was obtained from the California Department of Transportation and supplemented by field investigation. Existing land use came from aerial photography coverage and field verification. Land ownership was provided by a combined effort of USFWS and TNC.

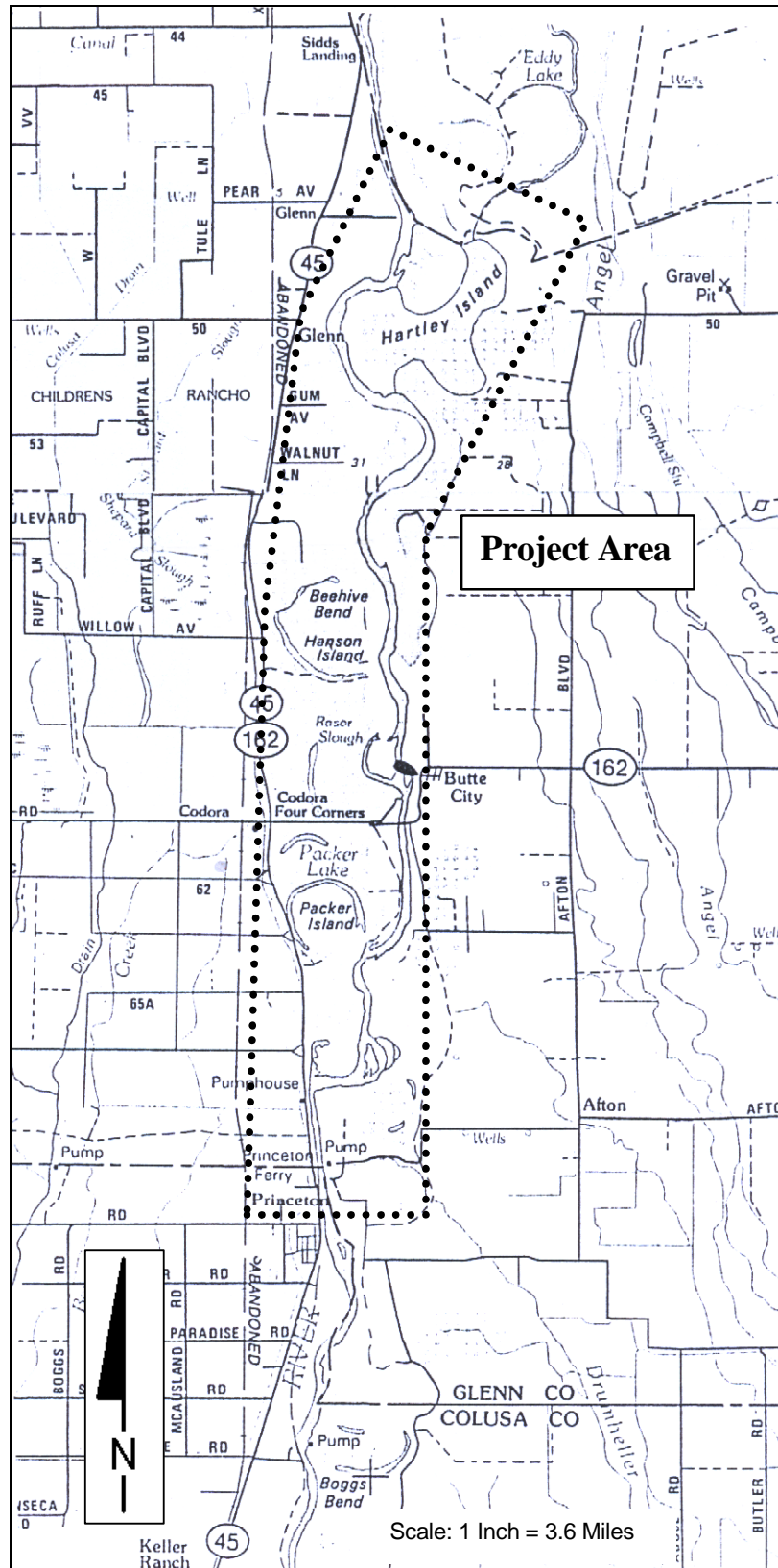
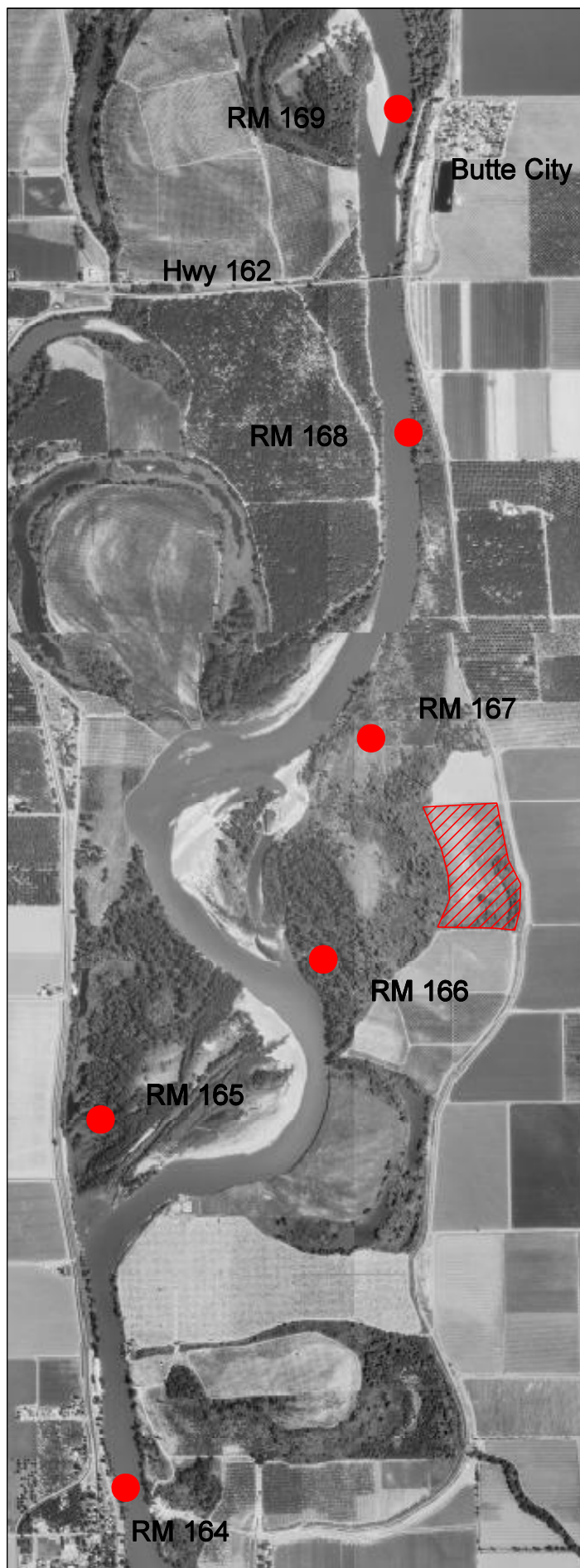


Figure 1. Project Location Map

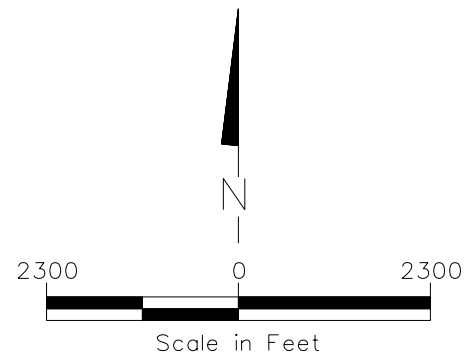


Notes:

1. 1998 Aerial Photo from USGS.

Legend

— Area of Grevie Property Proposed for Restoration



Sacramento River, California
Beehive Bend

**Figure 2. Grevie Property
Location Within Project Area**

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U.S. Fish and Wildlife Services
December 2005

3.0 DESCRIPTION OF HYDRAULIC MODELS

3.1 Model 1: Existing Conditions

The existing conditions model represents 1997 land use conditions taken from 1997 aerial photography, provided by TNC. In addition, the Department of Water Resources “1997 Sacramento River Atlas” (DWR, 1999) was used to confirm land use. A map showing the land uses for the existing conditions model, as well as the hydraulic model cross section locations is shown in **Figure 3**. This model serves as the base model for the restoration conditions.

3.2 Model 2: Riparian Habitat Conservation Configuration (Ayres Associates, 2001)

This model represents a riparian vegetation conservation and restoration configuration that has minimal impacts on the levees and channel. The land use conditions were determined using an iterative design approach through a joint effort between TNC ecologists and Ayres Associates engineers. The preferred land cover configuration included a mix of riparian vegetation, orchard, and grass/sedge meadows (savannah). It was developed to minimize hydraulic impacts while providing environmental benefits. The land uses developed for this model are shown in **Figure 4**.

3.3 Model 2 with Ownership Ground Truthing

Model 2 was originally completed 2 years prior to this report, since then, some parcels have changed ownership. In addition, land uses specified in the original model run were part of a conceptual sensitivity analysis. However, this current effort is not that type of analysis, therefore land uses were changed to reflect current uses in locations not planned for restoration. These changes are referred to as ground truthing and are shown in **Figure 5**. Model 2 was not rerun with the ground truthing changes since it would not meet the Reclamation Board Standards. However, since this model is the basis for the flood neutral configuration, it was an important intermediate step to show the process of making the project reach flood neutral.

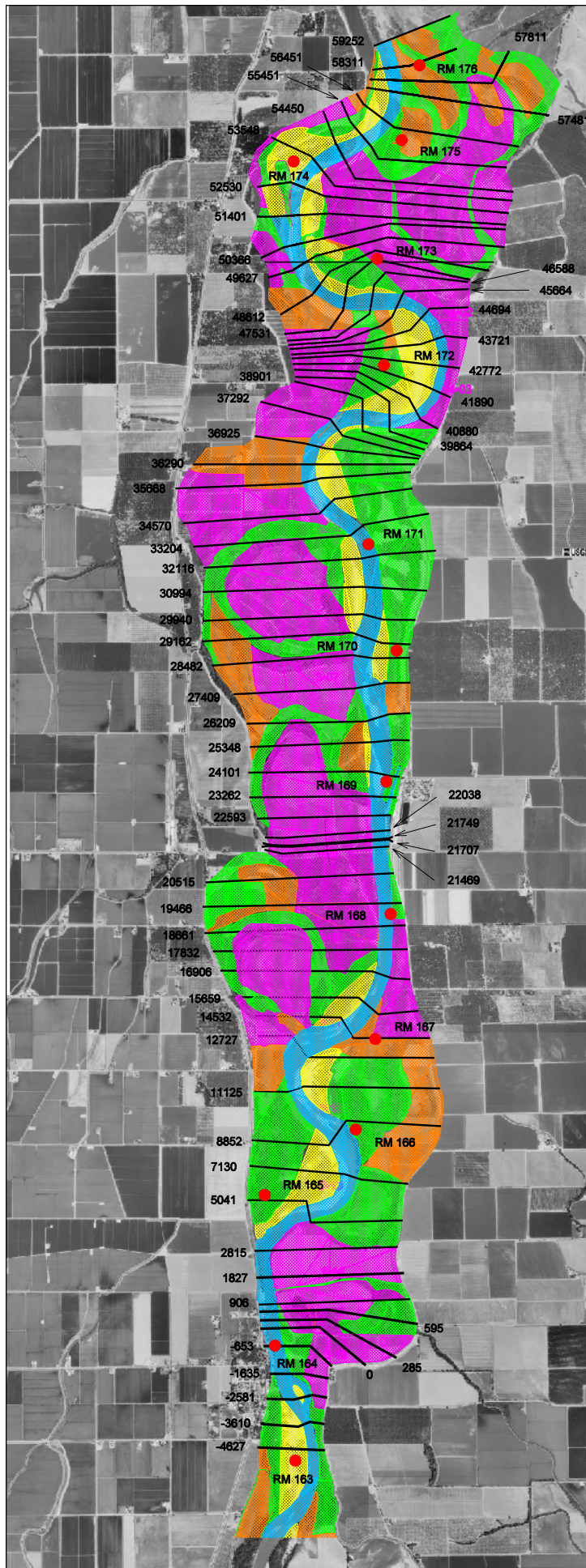
3.4 Model 3: Flood Neutral Restoration Configuration

This model represents a lesser extent of riparian vegetation restoration than Model 2 for the purpose of making it flood neutral. This model has the benefits of riparian restoration however with slightly more savannah land cover to reduce areas where the 100-yr water surface elevation exceeded the existing conditions water surface elevation.

The conversion of land uses was from riparian to savannah and only occurred in lands owned by TNC or USFWS. A map showing the land ownership is shown in **Figure 6**. An iterative process was used to achieve a flood neutral state while still maintaining riparian restoration. The land uses for this modified model are shown in **Figure 7**, and the cross sections where land uses were changed (riparian converted to savannah) are underlined.

3.5 Model 4: Flood Neutral Restoration including Riparian Habitat on Grevie Parcel

TNC is intends to establish riparian forest on a new parcel (Grevie parcel) between RM 166 and 167 directly adjacent to the east side levee. This model represents the conversion of portions of the Grevie parcel from crops to riparian habitat. The area of the parcel proposed for conversion is approximately 45 acres. The model was rerun with a riparian habitat land use to check the affect of the planting on the flood neutrality of the 100-year water surface. The land uses for this model is shown in **Figure 8** and the cross sections that have changed from the previous flood neutral model are underlined in red.

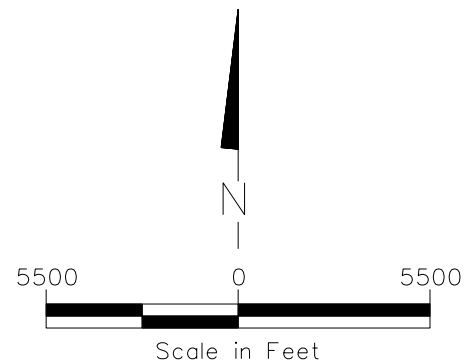


Notes:

1. 1998 Aerial Photo from USGS.

Legend

- Channel (n=0.03)
- Gravel / Sandbar (n=0.035)
- Crops / Open Space (n=0.035)
- Savanah (n= 0.04)
- Riparian Vegetation (n= 0.16)
- Prune and Young Walnut Orchard (n=0.10)
- Mature Walnut Orchards (n=0.08)



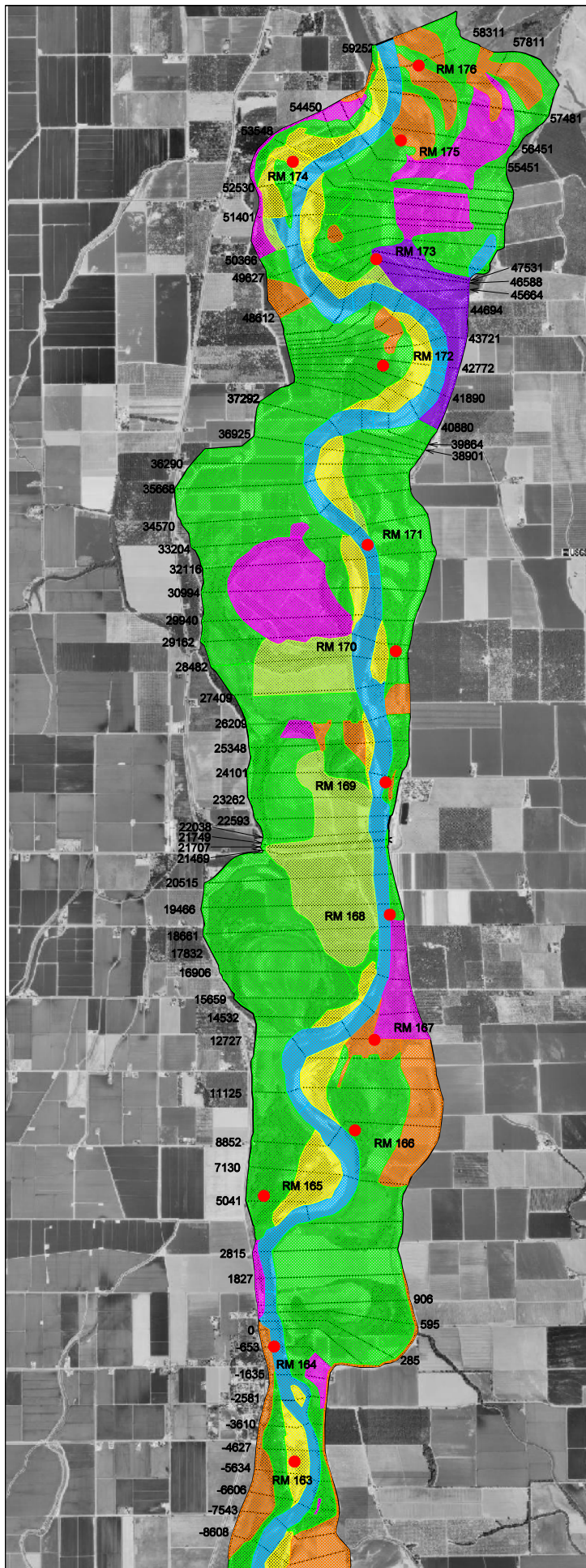
Sacramento River, California
Beehive Bend

**Figure 3. Existing Conditions
Land Uses for Model 1**

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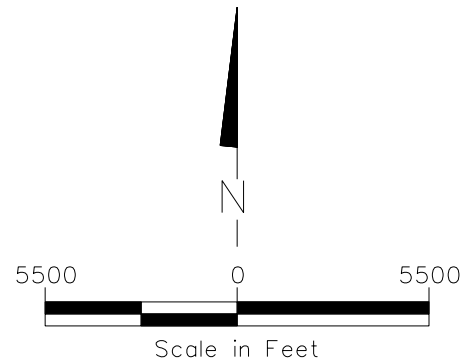


Notes:

1. 1998 Aerial Photo from USGS.

Legend

- Channel (n=0.03)
- Gravel / Sandbar (n=0.035)
- Crops / Open Space (n=0.035)
- Savannah (n=0.04)
- Riparian Vegetation (n=0.16)
- Prune and Young Walnut Orchard (n=0.10)
- Mature Walnut Orchards (n=0.08)

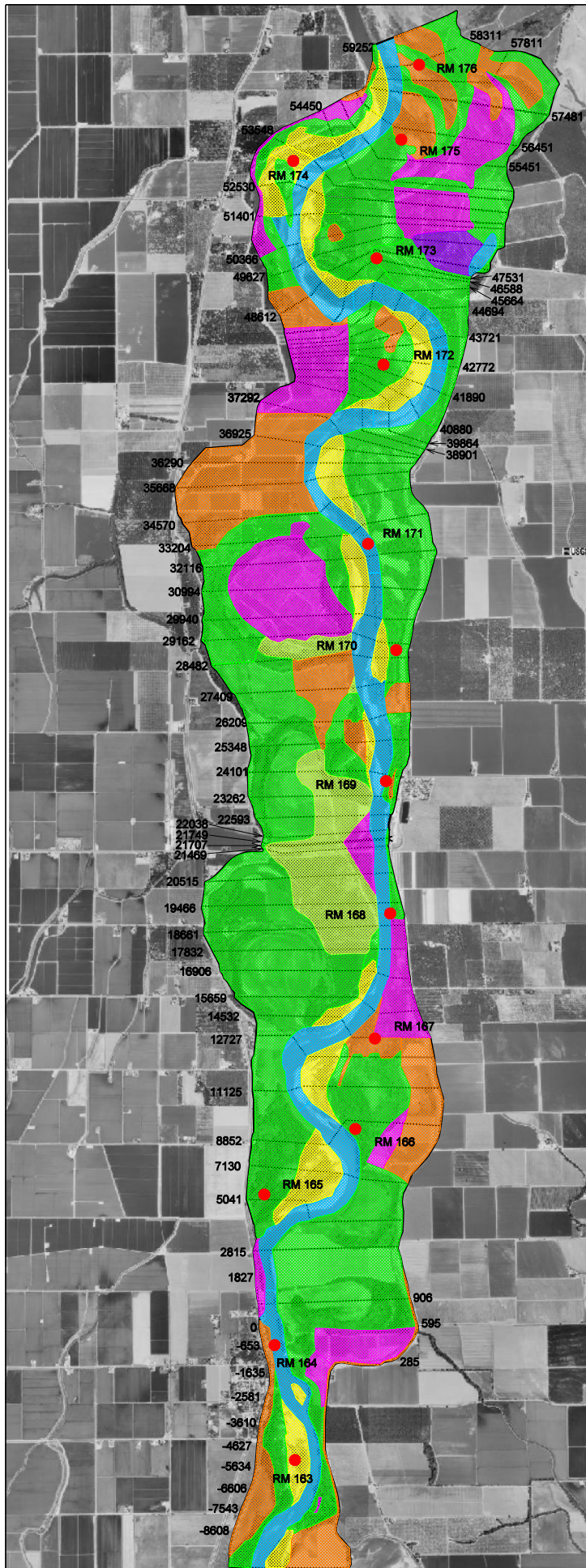


Sacramento River, California
Beehive Bend

**Figure 4. Riparian Vegetation
Conservation and Restoration
Land Uses for Model 2**

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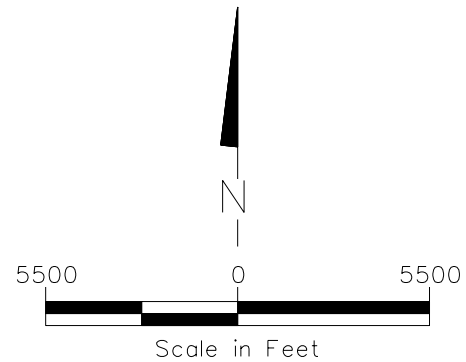


Notes:

1. 1998 Aerial Photo from USGS.
2. This is NOT a model run, only an intermediate step.

Legend

- Channel ($n=0.03$)
- Gravel / Sandbar ($n=0.035$)
- Crops / Open Space ($n=0.035$)
- Savannah ($n=0.04$)
- Riparian Vegetation ($n=0.16$)
- Prune and Young Walnut Orchard ($n=0.10$)
- Mature Walnut Orchards ($n=0.08$)



Sacramento River, California
Beehive Bend

Figure 5. Model 2 with Ownership and Land Use Ground Truthing and Cross Section Locations

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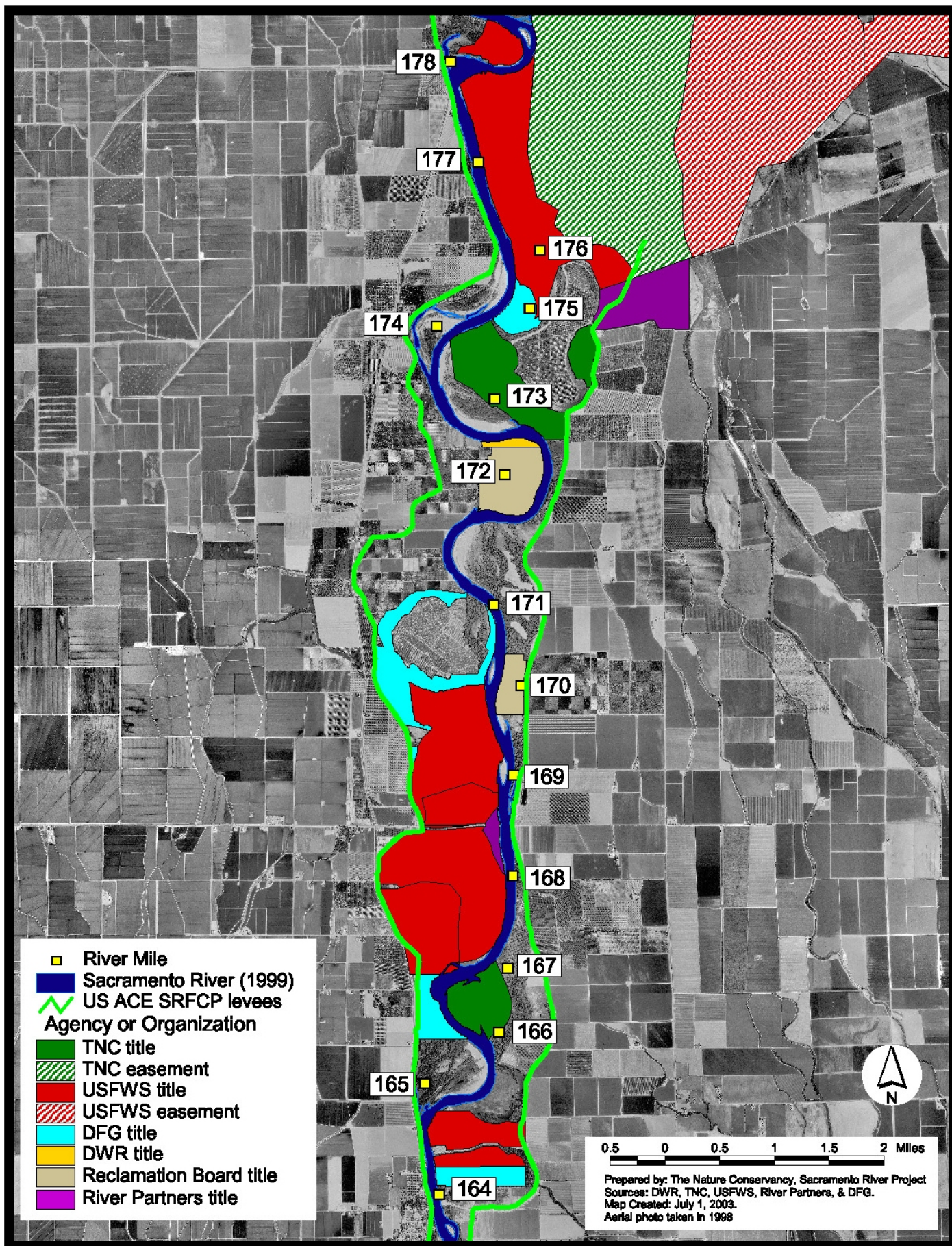
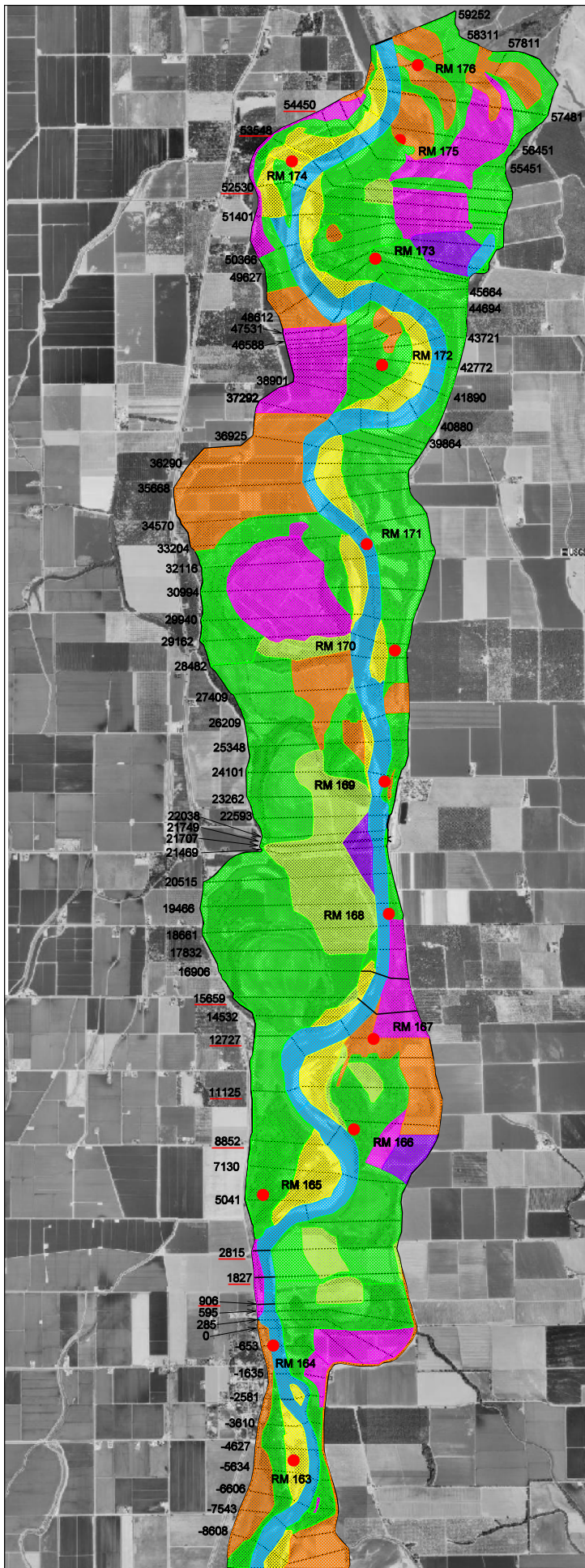


Figure 6. Ownership of Conservation Lands on the Beehive Bend Sub-reach

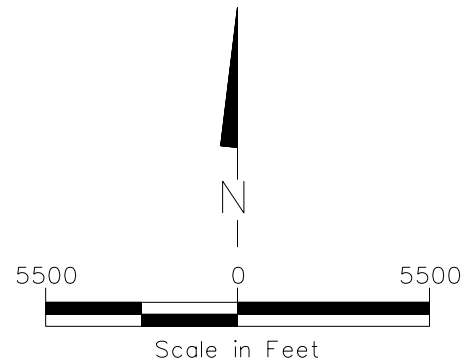


Notes:

1. Only the underlined cross sections were changed to this run.
2. Land use changes where from riparian to savannah on TNC or USFWS lands.
3. 1998 Aerial Photo from USGS.

Legend

- Channel ($n=0.03$)
- Gravel / Sandbar ($n=0.035$)
- Crops / Open Space ($n=0.035$)
- Savannah ($n= 0.04$)
- Riparian Vegetation ($n= 0.16$)
- Prune and Young Walnut Orchard ($n=0.10$)
- Mature Walnut Orchards ($n=0.08$)

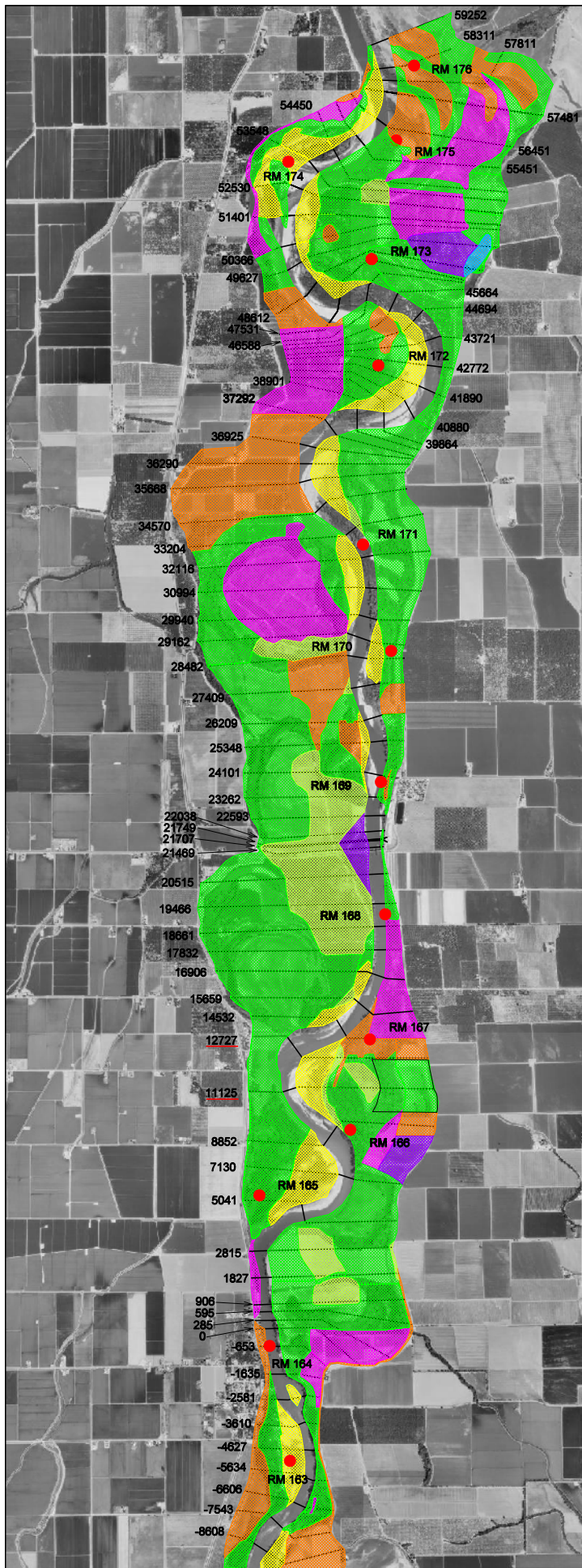


Sacramento River, California
Beehive Bend

**Figure 7. Flood Neutral Land Use
and Cross Section Locations
for Model 3**

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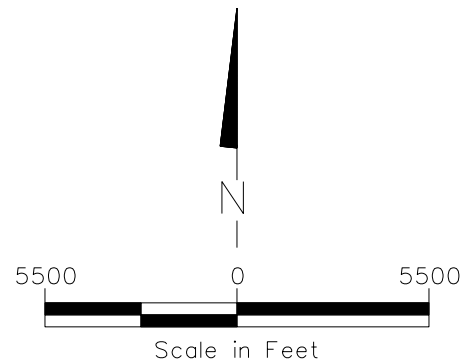
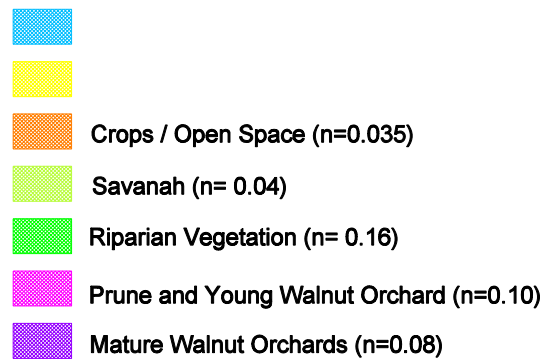
U.S. Fish and Wildlife Services
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Notes:

1. Only the underlined cross sections were changed to this run.
2. Land use changes where from riparian to savannah on TNC or USFWS lands.
3. 1998 Aerial Photo from USGS.

Legend



Sacramento River, California
Beehive Bend

**Figure 8. Flood Neutral Land Use
with Additional Riparian Habitat
on Grevie Property for Model 4**

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November 2005

4.0 HYDRAULIC ANALYSIS

4.1 Calibration and Boundary Conditions

The models were calibrated to 1998 flood conditions, using the stream flow data from the Butte City gage, located at approximately RM 168.5. The peak stage and flow from the Butte City gage were obtained through the California Department of Water Resources' California Data Exchange Center (CDEC) website. The peak flow was 151,000 cfs, with the corresponding peak stage at 92.48 feet.

4.2 Material Roughness

Manning's Roughness Coefficients (n-value) were used to reflect the different land uses in the hydraulic models. Ayres Associates estimated the values through a field investigation, which looked at land use and density, and with the use of various references (USBR, SCS, USGS). The Manning's n-value was refined to achieve the calibration boundary conditions. The final n-values used in the models are presented in **Table 1**.

Table 1. Manning's Roughness Coefficients

Land Use Description	n-Value
Main Channel	0.030
Riparian Vegetation	0.160
Prune and Young Walnut Orchard	0.100
Mature Walnut Orchard	0.080
Cultivated Fields (Fallow) / Open Space	0.035
Gravel / Sandbar	0.040
Savannah (Grass / Sedge and Sparse Shrubs)	0.040

5.0 HYDRAULIC MODELING RESULTS

5.1 Model 1: Existing Conditions Results

The existing conditions model represents the water surface, velocity, and freeboard of the system as it appeared in 1997 and was computed as a base to compare changes in land use to the system and any effects they may have on hydraulics. The water surface elevation, freeboard, and velocity are shown in **Table 2**. The freeboard, difference between the water surface elevation and the top of levee elevation, is mandated by the State of California (CCR Title 23). The requirements are a minimum of three (3) feet of freeboard for any flood control levee and four (4) feet of freeboard for a flood control levee within 100 feet of a bridge.

5.2 Model 2: Riparian Vegetation Conservation and Restoration Configuration Results

Model 2 was designed to represent a maximum riparian vegetation conservation and restoration configuration that would not exceed minimum freeboard requirements. For this configuration, cross sections –1635 to 7130, 11125 to 29940, and 32116 to 55451 had land use changes to reflect more riparian growth and some savannah. The resulting water surface elevations, freeboard, and velocities for this configuration are shown in **Table 2**, as well as the changes to water surface and velocity. This model does increase the water surface elevation (shaded cells) from cross sections 2815 to 22338 and 38901 to 59252. These increases were not acceptable by the Reclamation Board guidelines, which mandated that the project be flood neutral (no increase in water surface over existing conditions, regardless of freeboard).

5.3 Model 3: Flood Neutral Riparian Restoration Results

Model 3 was designed to provide the maximum riparian vegetation conservation and restoration, while maintaining flood neutral water surface elevations (i.e. no increases in water surface elevation over the existing condition). The “no increase” in water surface elevation was a guideline set by the Reclamation Board. This Model takes Model 2 and incorporates more savannah cover to reduce locations of increased water surface elevation from Model 2. The cross sections where some riparian was converted to savannah are underlined in Figure 6.

The water surface elevation, freeboard, and velocity for this configuration are shown in **Table 3**. This run achieves the goal of flood neutral with every water surface elevation either slightly reducing or remaining the same.

Channel velocities vary somewhat at individual cross sections, however the changes in land use do not significantly affect the range of velocities within the entire study reach. Based on the small change in depth and velocity, no change is expected in potential bed and bank erosion. On the Sacramento River, most of the sediment transport occurs in the main channel. Since no planting changes are being made to the main channel, sediment transport during the main channel will remain unchanged as compared to existing conditions.

5.4 Model 4: Flood Neutral Restoration including Riparian Habitat on Grevie Parcel Results

Model 4 was designed to reflect the planned additional riparian planting on the Grevie parcel (approximately 45 acres) adjacent to the east side of the levee between River Miles 166 and 167. This property was previously modeled as private crop/open space with a Manning’s roughness coefficient of 0.035. Because of the planned conversion to riparian habitat, the roughness coefficient was changed to 0.160. This results in a slight increase in the water surface elevation in the vicinity of the proposed additional riparian habitat in comparison to Model 3. However, the resultant water surface elevation is lower than the water surface in the existing conditions model. Thus, the flood neutrality of the system is still maintained with regard to the existing conditions water surface elevations. The results are summarized in the **Table 4**. This model also shows no significant change in water surface elevations at the model boundaries so there will be no change in outflows into the Butte Basin.

6.0 CONCLUSIONS

Based on our hydraulic analysis of the proposed land changes to the Grevie parcel, we offer the following conclusion:

1. As illustrated in **Table 4** the additional riparian plantings on the Grevie parcel (adjacent to the east levee between RM 166 and 167) will cause a slight increase in the water surface elevation over the previously modeled restoration configuration. However, it will not exceed the water surface elevations for the existing conditions model since the previously modeled restoration showed a decrease in this area. The flood neutrality of the system will be maintained with the proposed riparian planting.
2. The additional riparian plantings on the Grevie parcel will not impact the overflows into the Butte Basin since there are negligible differences in the water surface elevations at the boundary locations (0.00 ft at the downstream boundary and -0.03 ft at the upstream end).

Table 2. Model 2: Previous Riparian Vegetation Conservation and Restoration Configuration Results

Comparison of Existing to Proposed Project Hydraulic Conditions

Cross Section	Existing Water Surface ft	With Project Water Surface ft	Change in Water Surface ft	Left Levee Elevation ft	Right Levee Elevation ft	Existing Freeboard ¹ ft	With Project Freeboard ¹ ft	Existing Velocity ft/s	With Project Velocity ft/s	Change in Velocity ft/s
59252	101.12	101.35	0.23		108.55	7.43	7.2	8.75	8.61	-0.14
58311	100.68	100.93	0.25		107.75	7.07	6.82	8.55	8.4	-0.15
57881	100.91	101.16	0.25		107.81	6.9	6.65	5.95	5.79	-0.16
57481	100.79	101.05	0.26	108.3	108.46	7.51	7.25	5.67	5.52	-0.15
56451	100.41	100.7	0.29	107.43	108.79	7.02	6.73	6.11	5.93	-0.18
55451	100.23	100.51	0.28	107.43	108.2	7.2	6.92	5.61	5.6	-0.01
54450	99.87	100.08	0.21	106.6	107.96	6.73	6.52	5.96	6.19	0.23
53548	99.81	100.02	0.21	105.8	106.67	5.99	5.78	4.19	4.34	0.15
52530	99.58	99.77	0.19	105.4	106.99	5.82	5.63	5.43	5.62	0.19
51401	99.45	99.63	0.18	105.5	106.5	6.05	5.87	3.72	3.87	0.15
50366	99.26	99.41	0.15	105.7	105.28	6.02	5.74	3.46	3.77	0.31
49627	99	99.13	0.13	105.5	104.74	5.74	5.61	4.65	4.78	0.13
48612	98.95	99.1	0.15	104.33	104.15	5.2	5.05	3.63	3.59	-0.04
47531	98.66	98.78	0.12	105.1	104.45	5.79	5.67	4.96	5.08	0.12
46588	98.53	98.64	0.11	104.3	104.19	5.66	5.55	4.23	4.34	0.11
45664	98.09	98.17	0.08	105.1	104.2	6.11	6.03	5.69	5.81	0.12
44694	97.91	97.98	0.07	104.1	104.2	6.19	6.12	6.36	6.54	0.18
43721	97.82	97.88	0.06	102.8	102.89	4.98	4.92	5.32	5.43	0.11
42772	97.63	97.67	0.04	103.9	102.9	5.27	5.23	5.6	5.76	0.16
41890	97.55	97.59	0.04	102.6	102.86	5.05	5.01	5.51	5.67	0.16
40880	97.5	97.54	0.04	102.93	102.6	5.1	5.06	4.8	4.91	0.11
39864	97.34	97.37	0.03	102.5	103.14	5.16	5.13	4.98	5.09	0.11
38901	97.14	97.17	0.03	102.25	103.3	5.11	5.08	5.08	5.16	0.08
37292	96.54	96.53	-0.01	102.1	103.11	5.56	5.57	7.21	7.34	0.13
36925	96.48	96.3	-0.18	102.1	103.9	5.62	5.80	6.3	7.32	1.02
36290	96.39	96.23	-0.16	101.9	103.08	5.51	5.67	5.94	6.57	0.63
35668	96.21	96.01	-0.2	101.6	101.72	5.39	5.59	5.77	5.65	-0.12
34570	95.85	95.48	-0.37	101.8	102.04	5.95	6.32	6.1	6.4	0.3
33204	95.64	95.25	-0.39	102.5	101.58	5.94	6.33	5.81	6.02	0.21
32116	95.38	94.97	-0.41	101.6	100.9	5.52	5.93	6.05	6.27	0.22
30994	95.15	94.72	-0.43	100.8	101.5	5.65	6.08	5.88	6.1	0.22
29940	94.97	94.51	-0.46	101	101.07	6.03	6.49	5.64	5.95	0.31
29162	94.92	94.46	-0.46	100.6	100.85	5.68	6.14	4.51	4.7	0.19
28482	94.74	94.16	-0.58	99.9	100.5	5.16	5.74	5.32	6.04	0.72
27409	94.54	94.11	-0.43	100	100.89	5.46	5.89	5.39	5.05	-0.34
26209	94.41	93.87	-0.54	99.7	99.72	5.29	5.83	4.12	4.71	0.59
25348	94.06	93.47	-0.59	99.8	99.69	5.63	6.22	5.5	5.95	0.45
24101	93.77	93.18	-0.59	98.9	100.11	5.13	5.72	5.35	5.5	0.15
23262	93.43	93	-0.43	98.7	100.45	5.27	5.70	4.23	5.08	0.85
22593	92.83	92.74	-0.09	98.3	99.57	5.47	5.56	6.13	5.99	-0.14
22338	92.63	92.66	0.03	98.4	99.6	5.77	5.74	6.83	6.26	-0.57
21749	92.48	92.54	0.06	102.16	98.6	6.12	6.06	6.45	6.02	-0.43
Bridge										0
21707	92.29	92.57	0.28	102.2	99.74	7.45	7.17	6.69	4.79	-1.9
21469	92.17	92.49	0.32	99.2	99.19	7.02	6.70	6.01	4.74	-1.27
20515	91.91	92.21	0.3	98.85	99.24	6.94	6.64	4.53	4.83	0.3
19466	91.6	91.87	0.27	98.5	100.3	6.90	6.63	4.34	4.76	0.42
18661	91.01	91.38	0.37	96.8	100.89	5.79	5.42	5.94	5.82	-0.12
17832	90.48	91.05	0.57	96.8	99.79	6.32	5.75	5.88	5.3	-0.58
16906	89.83	90.27	0.44	96.4	99.66	6.57	6.13	7.19	7.34	0.15

Table 2. Model 2: Previous Riparian Vegetation Conservation and Restoration Configuration Results

Comparison of Existing to Proposed Project Hydraulic Conditions

Cross Section	Existing Water Surface ft	With Project Water Surface ft	Change in Water Surface ft	Left Levee Elevation ft	Right Levee Elevation ft	Existing Freeboard ¹ ft	With Project Freeboard ¹ ft	Existing Velocity ft/s	With Project Velocity ft/s	Change in Velocity ft/s
15659	89.81	90.2	0.39	96.7	98.98	6.89	6.50	5.33	5.82	0.49
14532	89.72	90.15	0.43	96.8	98.13	7.08	6.65	4.34	4.43	0.09
12727	89.59	90.02	0.43	96.6	96.74	7.01	6.58	3.87	3.87	0
11125	89.45	89.75	0.3	96.6	97.93	7.15	6.85	4.48	5.51	1.03
8852	89.28	89.62	0.34	95.7	98.33	6.42	6.08	3.63	3.58	-0.05
7130	89.16	89.51	0.35	94.4	97.63	5.24	4.89	3.93	3.85	-0.08
5041	88.99	89.36	0.37	94.6	96.7	5.61	5.24	4.15	3.88	-0.27
2815	88.21	88.44	0.23	94.1	95.29	5.89	5.66	6.67	7	0.33
1827	86.32	86.16	-0.16	94.3	96.37	7.98	8.14	9.31	9.55	0.24
906	86.32	85.67	-0.65	94.1	98.18	7.78	8.43	7.24	8.8	1.56
595	86.07	85.67	-0.4	94.3	97.03	8.23	8.63	7.72	8.15	0.43
285	85.74	85.27	-0.47	92	93.23	6.26	6.73	8.18	8.69	0.51
0	85.43	85	-0.43	93.33	93.5	7.90	8.33	8.68	9.01	0.33
-653	84.9	84.51	-0.39	92.9	93.42	8.00	8.39	9.61	9.79	0.18
-1635	84.37	84.18	-0.19	91.67	94.14	7.30	7.49	8.63	8.87	0.24
-2581	84.25	84.25	0	92.02	95.02	7.77	7.77	6.39	6.39	0
-3612	83.57	83.57	0	92.72	92.92	9.15	9.15	7.13	7.13	0
-4627	82.76	82.76	0	93.79	93.26	10.50	10.50	8.94	8.94	0

NOTE

Cells that have a black border reflect areas of changed land use from existing conditions

Cells that are shaded have a higher water surface elevation for with project conditions than existing conditions

¹ Minimum freeboard calculated using lowest levee elevation.

Table 3. Model 3: Flood Neutral Results (From Previous Report on Septmeber 25, 2005)

Comparison of Existing to Proposed Project Hydraulic Conditions

Cross Section	Existing Water Surface	With Project Water Surface	Change in Water Surface	Left Levee Elevation	Right Levee Elevation	Existing Freeboard ¹	With Project Freeboard ¹	Existing Velocity	With Project Velocity	With Project Velocity
	ft	ft	ft	ft	ft	ft	ft	ft/s	ft/s	ft/s
59252	101.12	101.09	-0.03		108.55	7.43	7.46	8.75	8.83	0.08
58311	100.68	100.65	-0.03		107.75	7.07	7.1	8.55	8.65	0.1
57881	100.91	100.88	-0.03		107.81	6.9	6.93	5.95	6.03	0.08
57481	100.79	100.76	-0.03	108.3	108.46	7.51	7.54	5.67	5.77	0.1
56451	100.41	100.38	-0.03	107.43	108.79	7.02	7.05	6.11	6.22	0.11
55451	100.23	100.18	-0.05	107.43	108.2	7.2	7.25	5.61	5.81	0.2
54450	99.87	99.82	-0.05	106.6	107.96	6.73	6.78	5.96	5.57	-0.39
53548	99.81	99.78	-0.03	105.8	106.67	5.99	6.02	4.19	3.9	-0.29
52530	99.58	99.52	-0.06	105.4	106.99	5.82	5.88	5.43	5.04	-0.39
51401	99.45	99.35	-0.1	105.5	106.5	6.05	6.15	3.72	3.97	0.25
50366	99.26	99.11	-0.15	105.7	105.28	6.02	6.17	3.46	3.93	0.47
49627	99	98.85	-0.15	105.5	104.74	5.74	5.89	4.65	4.72	0.07
48612	98.95	98.81	-0.14	104.33	104.15	5.2	5.34	3.63	3.57	-0.06
47531	98.66	98.4	-0.26	105.1	104.45	5.79	6.05	4.96	5.49	0.53
46588	98.53	98.25	-0.28	104.3	104.19	5.66	5.94	4.23	4.57	0.34
45664	98.09	97.73	-0.36	105.1	104.2	6.11	6.47	5.69	6.05	0.36
44694	97.91	97.51	-0.4	104.1	104.2	6.19	6.59	6.36	6.82	0.46
43721	97.82	97.41	-0.41	102.8	102.89	4.98	5.39	5.32	5.63	0.31
42712	97.63	97.21	-0.42	103.9	102.9	5.27	5.69	5.6	5.9	0.3
41890	97.55	97.12	-0.43	102.6	102.86	5.05	5.48	5.51	5.8	0.29
40880	97.5	97.06	-0.44	102.93	102.6	5.1	5.54	4.8	5.06	0.26
39864	97.34	96.91	-0.43	102.5	103.14	5.16	5.59	4.98	5.14	0.16
38901	97.14	96.7	-0.44	102.25	103.3	5.11	5.55	5.08	5.22	0.14
37292	96.54	96.07	-0.47	102.1	103.11	5.56	6.03	7.21	7.34	0.13
36925	96.48	95.97	-0.51	102.1	103.9	5.62	6.13	6.3	6.64	0.34
36290	96.39	95.89	-0.5	101.9	103.08	5.51	6.01	5.94	6.23	0.29
35668	96.21	95.75	-0.46	101.6	101.72	5.39	5.85	5.77	5.89	0.12
34570	95.85	95.4	-0.45	101.8	102.04	5.95	6.40	6.1	6.31	0.21
33204	95.64	95.16	-0.48	102.5	101.58	5.94	6.42	5.81	6.02	0.21
32116	95.38	94.86	-0.52	101.6	100.9	5.52	6.04	6.05	6.31	0.26
30994	95.15	94.61	-0.54	100.8	101.5	5.65	6.19	5.88	6.15	0.27
29940	94.97	94.38	-0.59	101	101.07	6.03	6.62	5.64	6.01	0.37
29162	94.92	94.34	-0.58	100.6	100.85	5.68	6.26	4.51	4.74	0.23
28482	94.74	93.97	-0.77	99.9	100.5	5.16	5.93	5.32	6.31	0.99
27409	94.54	93.91	-0.63	100	100.89	5.46	6.09	5.39	5.39	0
26209	94.41	93.71	-0.7	99.7	99.72	5.29	5.99	4.12	4.49	0.37
25348	94.06	93.26	-0.8	99.8	99.69	5.63	6.43	5.5	6.04	0.54
24101	93.77	92.96	-0.81	98.9	100.11	5.13	5.94	5.35	5.58	0.23
23262	93.43	92.76	-0.67	98.7	100.45	5.27	5.94	4.23	5.16	0.93
22593	92.83	92.49	-0.34	98.3	99.57	5.47	5.81	6.13	6.1	-0.03
22338	92.63	92.35	-0.28	98.4	99.6	5.77	6.05	6.83	6.59	-0.24
21749	92.48	92.24	-0.24	102.16	98.6	6.12	6.36	6.45	5.7	-0.75
Bridge										0
21707	92.29	92.17	-0.12	102.2	99.74	7.45	7.57	6.69	5.06	-1.63
21469	92.17	92.09	-0.08	99.2	99.19	7.02	7.10	6.01	4.76	-1.25
20515	91.91	91.7	-0.21	98.85	99.24	6.94	7.15	4.53	5.06	0.53
19466	91.6	91.28	-0.32	98.5	100.3	6.90	7.22	4.34	4.4	0.06
18661	91.01	90.7	-0.31	96.8	100.89	5.79	6.10	5.94	6.13	0.19
17832	90.48	90.29	-0.19	96.8	99.79	6.32	6.51	5.88	5.65	-0.23
16906	89.83	89.38	-0.45	96.4	99.66	6.57	7.02	7.19	7.16	-0.03

Table 3. Model 3: Flood Neutral Results (From Previous Report on September 25, 2005)

Comparison of Existing to Proposed Project Hydraulic Conditions

Cross Section	Existing Water Surface	With Project Water Surface	Change in Water Surface	Left Levee Elevation	Right Levee Elevation	Existing Freeboard ¹	With Project Freeboard ¹	Existing Velocity	With Project Velocity	With Project Velocity
	ft	ft	ft	ft	ft	ft	ft	ft/s	ft/s	ft/s
15659	89.81	89.34	-0.47	96.7	98.98	6.89	7.36	5.33	5.27	-0.06
14532	89.72	89.24	-0.48	96.8	98.13	7.08	7.56	4.34	4.61	0.27
12727	89.59	89.11	-0.48	96.6	96.74	7.01	7.49	3.87	4.03	0.16
11125	89.45	88.94	-0.51	96.6	97.93	7.15	7.66	4.48	5.31	0.83
8852	89.28	88.78	-0.5	95.7	98.33	6.42	6.92	3.63	3.69	0.06
7130	89.16	88.64	-0.52	94.4	97.63	5.24	5.76	3.93	4.33	0.4
5041	88.99	88.48	-0.51	94.6	96.7	5.61	6.12	4.15	4	-0.15
2815	88.21	87.68	-0.53	94.1	95.29	5.89	6.42	6.67	6.35	-0.32
1827	86.32	85.88	-0.44	94.3	96.37	7.98	8.42	9.31	8.48	-0.83
906	86.32	85.76	-0.56	94.1	98.18	7.78	8.34	7.24	8.27	1.03
595	86.07	85.64	-0.43	94.3	97.03	8.23	8.66	7.72	8.18	0.46
285	85.74	85.37	-0.37	92	93.23	6.26	6.63	8.18	8.37	0.19
0	85.43	85.07	-0.36	93.33	93.5	7.90	8.26	8.68	8.83	0.15
-653	84.9	84.51	-0.39	92.9	93.42	8.00	8.39	9.61	9.79	0.18
-1635	84.37	84.18	-0.19	91.67	94.14	7.30	7.49	8.63	8.87	0.24
-2581	84.25	84.25	0	92.02	95.02	7.77	7.77	6.39	6.39	0
-3612	83.57	83.57	0	92.72	92.92	9.15	9.15	7.13	7.13	0
-4627	82.76	82.76	0	93.79	93.26	10.50	10.50	8.94	8.95	0.01

NOTE

Cells that have a black border reflect areas of changed land use

¹ Minimum freeboard calculated using lowest levee elevation.

Table 4. Model 4: Flood Neutral Results With Additional Riparian Planting
Comparison of Existing to Proposed Project Hydraulic Conditions (With Riparian Planting on Greive Property)

Cross Section	Existing Water Surface	With Project Water Surface	Change in Water Surface	Left Levee Elevation	Right Levee Elevation	Existing Freeboard ¹	With Project Freeboard ¹	Existing Velocity	With Project Velocity	With Project Velocity
	ft	ft	ft	ft	ft	ft	ft	ft/s	ft/s	ft/s
59252	101.12	101.09	-0.03		108.55	7.43	7.46	8.75	8.83	0.08
58311	100.68	100.65	-0.03		107.75	7.07	7.1	8.55	8.65	0.1
57881	100.91	100.88	-0.03		107.81	6.9	6.93	5.95	6.03	0.08
57481	100.79	100.76	-0.03	108.3	108.46	7.51	7.54	5.67	5.77	0.1
56451	100.41	100.38	-0.03	107.43	108.79	7.02	7.05	6.11	6.22	0.11
55451	100.23	100.18	-0.05	107.43	108.2	7.2	7.25	5.61	5.81	0.2
54450	99.87	99.83	-0.04	106.6	107.96	6.73	6.77	5.96	5.57	-0.39
53548	99.81	99.78	-0.03	105.8	106.67	5.99	6.02	4.19	3.9	-0.29
52530	99.58	99.53	-0.05	105.4	106.99	5.82	5.87	5.43	5.04	-0.39
51401	99.45	99.35	-0.1	105.5	106.5	6.05	6.15	3.72	3.97	0.25
50366	99.26	99.11	-0.15	105.7	105.28	6.02	6.17	3.46	3.93	0.47
49627	99	98.85	-0.15	105.5	104.74	5.74	5.89	4.65	4.72	0.07
48612	98.95	98.81	-0.14	104.33	104.15	5.2	5.34	3.63	3.57	-0.06
47531	98.66	98.4	-0.26	105.1	104.45	5.79	6.05	4.96	5.49	0.53
46588	98.53	98.26	-0.27	104.3	104.19	5.66	5.93	4.23	4.57	0.34
45664	98.09	97.74	-0.35	105.1	104.2	6.11	6.46	5.69	6.05	0.36
44694	97.91	97.52	-0.39	104.1	104.2	6.19	6.58	6.36	6.82	0.46
43721	97.82	97.41	-0.41	102.8	102.89	4.98	5.39	5.32	5.63	0.31
42772	97.63	97.21	-0.42	103.9	102.9	5.27	5.69	5.6	5.9	0.3
41890	97.55	97.12	-0.43	102.6	102.86	5.05	5.48	5.51	5.8	0.29
40880	97.5	97.06	-0.44	102.93	102.6	5.1	5.54	4.8	5.06	0.26
39864	97.34	96.91	-0.43	102.5	103.14	5.16	5.59	4.98	5.14	0.16
38901	97.14	96.7	-0.44	102.25	103.3	5.11	5.55	5.08	5.22	0.14
37292	96.54	96.08	-0.46	102.1	103.11	5.56	6.02	7.21	7.34	0.13
36925	96.48	95.98	-0.5	102.1	103.9	5.62	6.12	6.3	6.64	0.34
36290	96.39	95.9	-0.49	101.9	103.08	5.51	6.00	5.94	6.23	0.29
35668	96.21	95.76	-0.45	101.6	101.72	5.39	5.84	5.77	5.89	0.12
34570	95.85	95.41	-0.44	101.8	102.04	5.95	6.39	6.1	6.31	0.21
33204	95.64	95.17	-0.47	102.5	101.58	5.94	6.41	5.81	6.02	0.21
32116	95.38	94.87	-0.51	101.6	100.9	5.52	6.03	6.05	6.31	0.26
30994	95.15	94.62	-0.53	100.8	101.5	5.65	6.18	5.88	6.15	0.27
29940	94.97	94.4	-0.57	101	101.07	6.03	6.60	5.64	6.01	0.37
29162	94.92	94.35	-0.57	100.6	100.85	5.68	6.25	4.51	4.74	0.23
28482	94.74	93.98	-0.76	99.9	100.5	5.16	5.92	5.32	6.31	0.99
27409	94.54	93.92	-0.62	100	100.89	5.46	6.08	5.39	5.39	0
26209	94.41	93.72	-0.69	99.7	99.72	5.29	5.98	4.12	4.49	0.37
25348	94.06	93.27	-0.79	99.8	99.69	5.63	6.42	5.5	6.04	0.54
24101	93.77	92.97	-0.8	98.9	100.11	5.13	5.93	5.35	5.58	0.23
23262	93.43	92.77	-0.66	98.7	100.45	5.27	5.93	4.23	5.16	0.93
22593	92.83	92.51	-0.32	98.3	99.57	5.47	5.79	6.13	6.1	-0.03
22338	92.63	92.36	-0.27	98.4	99.6	5.77	6.04	6.83	6.59	-0.24
21749	92.48	92.26	-0.22	102.16	98.6	6.12	6.34	6.45	5.7	-0.75
Bridge										0
21707	92.29	92.19	-0.1	102.2	99.74	7.45	7.55	6.69	5.06	-1.63
21469	92.17	92.11	-0.06	99.2	99.19	7.02	7.08	6.01	4.76	-1.25
20515	91.91	91.72	-0.19	98.85	99.24	6.94	7.13	4.53	5.06	0.53
19466	91.6	91.3	-0.3	98.5	100.3	6.90	7.20	4.4	4.34	0.06
18661	91.01	90.73	-0.28	96.8	100.89	5.79	6.07	5.94	6.13	0.19
17832	90.48	90.32	-0.16	96.8	99.79	6.32	6.48	5.88	5.65	-0.23
16906	89.83	89.42	-0.41	96.4	99.66	6.57	6.98	7.19	7.16	-0.03

Table 4. Model 4: Flood Neutral Results With Additional Riparian Planting
Comparison of Existing to Proposed Project Hydraulic Conditions (With Riparian Planting on Greive Property)

Cross Section	Existing Water Surface ft	With Project Water Surface ft	Change in Water Surface ft	Left Levee Elevation ft	Right Levee Elevation ft	Existing Freeboard ¹ ft	With Project Freeboard ¹ ft	Existing Velocity ft/s	With Project Velocity ft/s	With Project Velocity ft/s
15659	89.81	89.38	-0.43	96.7	98.98	6.89	7.32	5.33	5.27	-0.06
14532	89.72	89.28	-0.44	96.8	98.13	7.08	7.52	4.34	4.61	0.27
12727	89.59	89.13	-0.46	96.6	96.74	7.01	7.47	3.87	4.03	0.16
11125	89.45	88.93	-0.52	96.6	97.93	7.15	7.67	4.48	5.31	0.83
8852	89.28	88.78	-0.5	95.7	98.33	6.42	6.92	3.63	3.69	0.06
7130	89.16	88.64	-0.52	94.4	97.63	5.24	5.76	3.93	4.33	0.4
5041	88.99	88.48	-0.51	94.6	96.7	5.61	6.12	4.15	4	-0.15
2815	88.21	87.68	-0.53	94.1	96.29	5.89	6.42	6.67	6.35	-0.32
1827	86.32	85.88	-0.44	94.3	96.37	7.98	8.42	9.31	8.48	-0.83
906	86.07	85.76	-0.31	94.1	98.18	7.78	8.34	7.24	8.27	1.03
595	86.07	85.64	-0.43	94.3	97.03	8.23	8.66	7.72	8.18	0.46
285	85.74	85.37	-0.37	92	93.23	6.26	6.63	8.18	8.37	0.19
0	85.43	85.07	-0.36	93.33	93.5	7.90	8.26	8.68	8.83	0.15
-653	84.9	84.51	-0.39	92.9	93.42	8.00	8.39	9.61	9.79	0.18
-1635	84.37	84.18	-0.19	91.67	94.14	7.30	7.49	8.63	8.87	0.24
-2581	84.25	84.25	0	92.02	96.02	7.77	7.77	6.39	6.39	0
-3612	83.57	83.57	0	92.72	92.92	9.15	9.15	7.13	7.13	0
-4627	82.76	82.76	0	93.79	93.26	10.50	10.50	8.94	8.95	0.01

NOTE

¹ Minimum freeboard calculated using lowest levee elevation.

7.0 REFERENCES

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U.S. Department of the Interior, Geologic Survey, "Water Supply Paper 1849, Roughness Characteristics of Natural Channels", 1967.

U.S. Department of the Interior, Geologic Survey, "Water Supply Paper 2339, Manning's Roughness Characteristics of Natural Channels and Flood Plains", 1989.

To: Ryan Luster, The Nature Conservancy

From: Thomas W. Smith

Date: August 27, 2007

Re: Memo – Amendment to Revised Flood Neutral Hydraulic Analysis for Riparian Habitat Conservation on the Sacramento River at Beehive Bend, RM 163 to RM 176

This memo is to summarize a minor change made to the previous Beehive Bend report produced by Ayres in December 2005. In that previous report a new run was completed that converted the land on the Grevie property to riparian forest. This amendment revises the land use slightly. The Grevies property (on the east floodplain between RM 166 and 167) has been renamed "Afton" and has a less dense planting configuration. This new planting allows for an elderberry and savannah corridor, as shown in the attached figure (provided by The Nature Conservancy).

The Manning's roughness coefficients were adjusted to represent the new land cover types on cross sections 12727 and 11125. The results of this new run, as well as comparisons to existing conditions are provided in the attached table. The land use change reduced the water surface over the previous full riparian run. In addition, the water surface is below the existing conditions run by roughly half a foot.

Overall, the changes on the Afton restoration community will not exceed existing conditions water surface elevation. The flood neutrality of the system will be maintained within the project area. In addition, there will be no impacts to the overflows into the Butte Basin.

Map 3. Afton 2 Restoration Communities

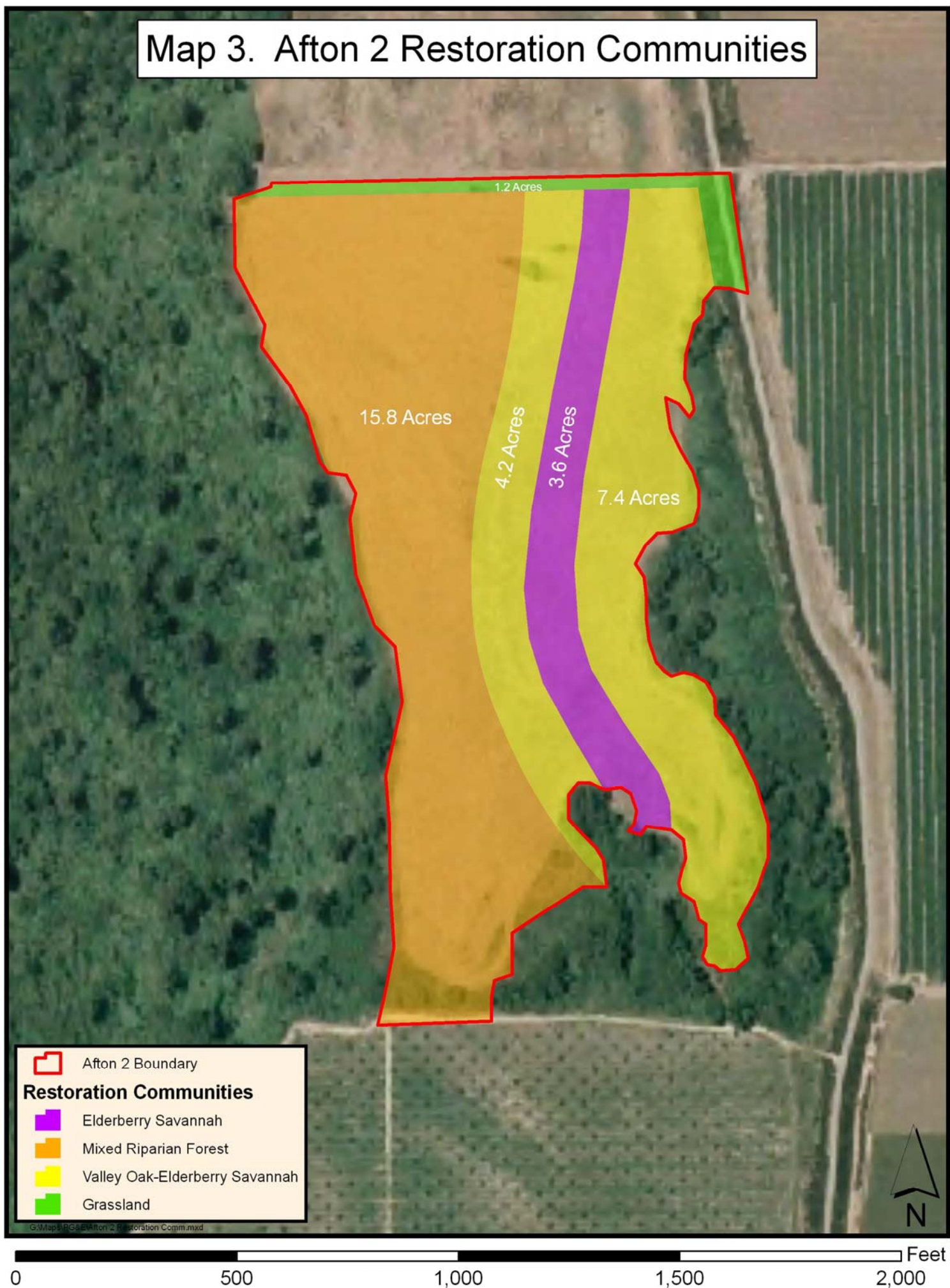


Table 5. Model 4: Flood Neutral Results With Modified Planting on Afton
Comparison of Existing to Proposed Project Hydraulic Conditions (With Riparian Planting on Grevie Property)

Cross Section	Existing Water Surface	With Project Water Surface	Change in Water Surface	Left Levee Elevation	Right Levee Elevation	Existing Freeboard ¹	With Project Freeboard ¹	Existing Velocity	With Project Velocity	With Project Velocity
	ft	ft	ft	ft	ft	ft	ft	ft/s	ft/s	ft/s
59252	101.12	101.09	-0.03		108.55	7.43	7.46	8.75	8.83	0.08
58311	100.68	100.65	-0.03		107.75	7.07	7.1	8.55	8.65	0.1
57881	100.91	100.88	-0.03		107.81	6.9	6.93	5.95	6.03	0.08
57481	100.79	100.76	-0.03	108.3	108.46	7.51	7.54	5.67	5.77	0.1
56451	100.41	100.38	-0.03	107.43	108.79	7.02	7.05	6.11	6.22	0.11
55451	100.23	100.18	-0.05	107.43	108.2	7.2	7.25	5.61	5.81	0.2
54450	99.87	99.83	-0.04	106.6	107.96	6.73	6.77	5.96	5.57	-0.39
53548	99.81	99.78	-0.03	105.8	106.67	5.99	6.02	4.19	3.9	-0.29
52530	99.58	99.53	-0.05	105.4	106.99	5.82	5.87	5.43	5.04	-0.39
51401	99.45	99.35	-0.1	105.5	106.5	6.05	6.15	3.72	3.97	0.25
50366	99.26	99.11	-0.15	105.7	105.28	6.02	6.17	3.46	3.93	0.47
49627	99	98.85	-0.15	105.5	104.74	5.74	5.89	4.65	4.72	0.07
48612	98.95	98.81	-0.14	104.33	104.15	5.2	5.34	3.63	3.57	-0.06
47531	98.66	98.4	-0.26	105.1	104.45	5.79	6.05	4.96	5.49	0.53
46588	98.53	98.26	-0.27	104.3	104.19	5.66	5.93	4.23	4.57	0.34
45664	98.09	97.74	-0.35	105.1	104.2	6.11	6.46	5.69	6.05	0.36
44694	97.91	97.52	-0.39	104.1	104.2	6.19	6.58	6.36	6.82	0.46
43721	97.82	97.41	-0.41	102.8	102.89	4.98	5.39	5.32	5.63	0.31
42772	97.63	97.21	-0.42	103.9	102.9	5.27	5.69	5.6	5.9	0.3
41890	97.55	97.11	-0.44	102.6	102.86	5.05	5.49	5.51	5.8	0.29
40880	97.5	97.05	-0.45	102.93	102.6	5.1	5.55	4.8	5.07	0.27
39864	97.34	96.9	-0.44	102.5	103.14	5.16	5.6	4.98	5.15	0.17
38901	97.14	96.69	-0.45	102.25	103.3	5.11	5.56	5.08	5.23	0.15
37292	96.54	96.05	-0.49	102.1	103.11	5.56	6.05	7.21	7.35	0.14
36925	96.48	95.95	-0.53	102.1	103.9	5.62	6.15	6.3	6.66	0.36
36290	96.39	95.86	-0.53	101.9	103.08	5.51	6.04	5.94	6.25	0.31
35668	96.21	95.72	-0.49	101.6	101.72	5.39	5.88	5.77	5.91	0.14
34570	95.85	95.38	-0.47	101.8	102.04	5.95	6.42	6.1	6.33	0.23
33204	95.64	95.13	-0.51	102.5	101.58	5.94	6.45	5.81	6.04	0.23
32116	95.38	94.84	-0.54	101.6	100.9	5.52	6.06	6.05	6.34	0.29
30994	95.15	94.58	-0.57	100.8	101.5	5.65	6.22	5.88	6.17	0.29
29940	94.97	94.35	-0.62	101	101.07	6.03	6.65	5.64	6.04	0.4
29162	94.92	94.3	-0.62	100.6	100.85	5.68	6.30	4.51	4.76	0.25
28482	94.74	93.94	-0.8	99.9	100.5	5.16	5.96	5.32	6.35	1.03
27409	94.54	93.87	-0.67	100	100.89	5.46	6.13	5.39	5.42	0.03
26209	94.41	93.67	-0.74	99.7	99.72	5.29	6.03	4.12	4.51	0.39
25348	94.06	93.22	-0.84	99.8	99.69	5.63	6.47	5.5	6.07	0.57
24101	93.77	92.92	-0.85	98.9	100.11	5.13	5.98	5.35	5.62	0.27
23262	93.43	92.72	-0.71	98.7	100.45	5.27	5.98	4.23	5.2	0.97
22593	92.83	92.44	-0.39	98.3	99.57	5.47	5.86	6.13	6.14	0.01
22338	92.63	92.3	-0.33	98.4	99.6	5.77	6.10	6.83	6.64	-0.19
21749	92.48	92.19	-0.29	102.16	98.6	6.12	6.41	6.45	5.75	-0.7
Bridge										0
21707	92.29	92.13	-0.16	102.2	99.74	7.45	7.61	6.69	5.11	-1.58
21469	92.17	92.04	-0.13	99.2	99.19	7.02	7.15	6.01	4.8	-1.21
20515	91.91	91.66	-0.25	98.85	99.24	6.94	7.19	4.53	5.1	0.57
19466	91.6	91.24	-0.36	98.5	100.3	6.90	7.26	4.34	5.13	0.79
18661	91.01	90.64	-0.37	96.8	100.89	5.79	6.16	5.94	6.27	0.33
17832	90.48	90.23	-0.25	96.8	99.79	6.32	6.57	5.88	5.81	-0.07
16906	89.83	89.31	-0.52	96.4	99.66	6.57	7.09	7.19	7.88	0.69

Table 5. Model 4: Flood Neutral Results With Modified Planting on Afton
Comparison of Existing to Proposed Project Hydraulic Conditions (With Riparian Planting on Grevie Property)

Cross Section	Existing Water Surface	With Project Water Surface	Change in Water Surface	Left Levee Elevation	Right Levee Elevation	Existing Freeboard ¹	With Project Freeboard ¹	Existing Velocity	With Project Velocity	With Project Velocity
	ft	ft	ft	ft	ft	ft	ft	ft/s	ft/s	ft/s
15659	89.81	89.28	-0.53	96.7	98.98	6.89	7.42	5.33	5.97	0.64
14532	89.72	89.18	-0.54	96.8	98.13	7.08	7.62	4.34	4.79	0.45
12727	89.59	89.03	-0.56	96.6	96.74	7.01	7.57	3.87	4.37	0.5
11125	89.45	88.82	-0.63	96.6	97.93	7.15	7.78	4.48	5.29	0.81
8852	89.28	88.65	-0.63	95.7	98.33	6.42	7.05	3.63	3.93	0.3
7130	89.16	88.52	-0.64	94.4	97.63	5.24	5.88	3.93	4.37	0.44
5041	88.99	88.36	-0.63	94.6	96.7	5.61	6.24	4.15	4.11	-0.04
2815	88.21	87.59	-0.62	94.1	95.29	5.89	6.51	6.67	6.43	-0.24
1827	86.32	85.97	-0.35	94.3	96.37	7.98	8.33	9.31	9.28	-0.03
906	86.32	85.76	-0.56	94.1	98.18	7.78	8.34	7.24	8.3	1.06
595	86.07	85.64	-0.43	94.3	97.03	8.23	8.66	7.72	8.17	0.45
285	85.74	85.38	-0.36	92	93.23	6.26	6.62	8.18	8.37	0.19
0	85.43	85.07	-0.36	93.33	93.5	7.90	8.26	8.68	8.83	0.15
-653	84.9	84.51	-0.39	92.9	93.42	8.00	8.39	9.61	9.79	0.18
-1635	84.37	84.18	-0.19	91.67	94.14	7.30	7.49	8.63	8.87	0.24
-2581	84.25	84.25	0	92.02	95.02	7.77	7.77	6.39	6.39	0
-3612	83.57	83.57	0	92.72	92.92	9.15	9.15	7.13	7.13	0
-4627	82.76	82.76	0	93.79	93.26	10.50	10.50	8.94	8.95	0.01

NOTE

¹ Minimum freeboard calculated using lowest levee elevation

APPENDIX D

Construction Noise Data

Appendix D
Project-Generated Construction Source Noise Prediction Model
 Cordora Restoration IS/MND



Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L _{eq} dBA)	Assumptions:	Reference Emission Noise Levels (L _{max}) at 50 feet ¹	Usage Factor ¹
Threshold*	3,514	50.0	Tractor	84	0.4
	50	86.9	Dozer	85	0.4
	100	80.9	Front End Loader	80	0.4
	1500	57.4	Scraper	85	0.4
	2000	54.9	Flat Bed Truck	84	0.4
	3300	50.5			
	3800	49.3			
			Ground Type	Hard	
			Source Height	8	
			Receiver Height	5	
			Ground Factor	0.00	
				Predicted Noise Level ²	L_{eq} dBA at 50 feet²
				Tractor	80.0
				Dozer	81.0
				Front End Loader	76.0
				Scraper	81.0
				Flat Bed Truck	80.0
				Combined Predicted Noise Level (L_{eq} dBA at 50 feet)	
				86.9	

Sources:

¹ Obtained from the FHWA Roadway Construction Noise Model, January 2006.

² Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$$L_{eq}(\text{equip}) = E.L. + 10 \cdot \log(U.F.) - 20 \cdot \log(D/50) - 10 \cdot G \cdot \log(D/50)$$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Model Input Sheet

Project Name : 911005.01
Project Number : Cordora Restoration IS/MND
Modeling Condition : Existing
Ground Type : Soft
Metric (L_{eq}, L_{dn}, CNEL) : Ldn

K Factor :
Traffic Desc. (Peak or ADT) : ADT



Segment	Roadway	Segment		Traffic Vol.	Speed (Mph)	Distance to CL	% Autos	%MT	% HT	Day %	Eve %	Night %	Offset (dB)
		From	To										
1	State Route 45	Junction Route 162	the North	2300	55	100	84.7	6.7	8.6	87		13	
2	State Route 162	Junction Route 45	the East	2400	55	100	80	2.7	17.3	87		13	

Appendix D
Traffic Noise Prediction Model, (FHWA RD-77-108)
Predicted Noise Levels

Project Name : 911005.01
Project Number : dora Restoration IS/MND
Modeling Condition : Existing
Metric (Leq, Ldn, CNEL) Ldn



Segment	Roadway	Segment		Noise Levels, dB Ldn				Distance to Traffic Noise Contours, Feet				
		From	To	Auto	MT	HT	Total	70 dB	65 dB	60 dB	55 dB	50 dB
1	State Route 45	Junction Route 162	the North	56.7	52.8	57.8	61.0	25	54	116	250	539
2	State Route 162	Junction Route 45	the East	56.6	49.0	61.0	62.5	32	69	148	318	686